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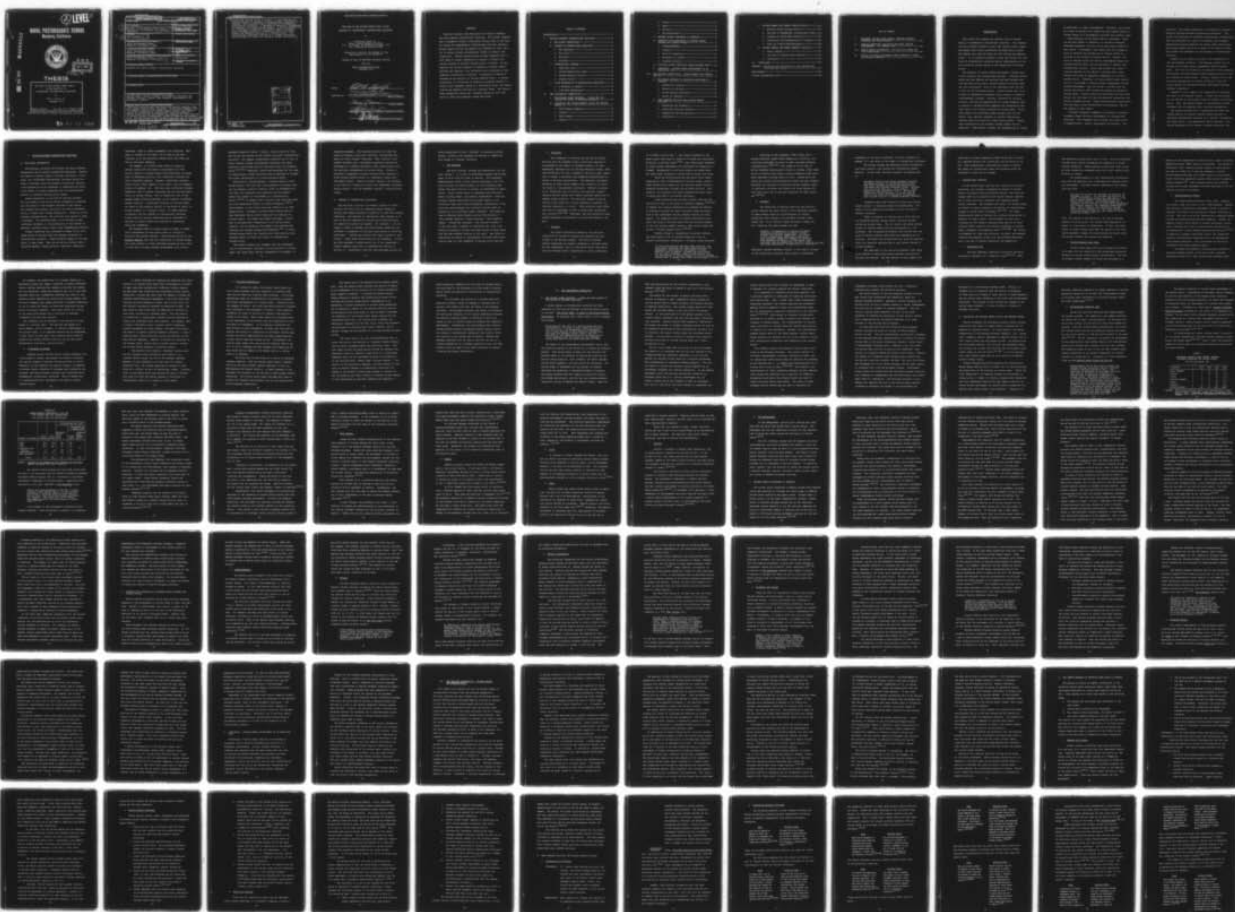
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THE ROLE OF THE NUCLEAR POWER ISSUE
IN THE ANALYSIS OF
CONTEMPORARY INTERNATIONAL RELATIONS

by

Ted A. Lloyd, Jr.

December 1978

Thesis Advisor

Lt. Col. D. P. Burke, USAF

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THE ROLE OF THE NUCLEAR POWER ISSUE IN THE
ANALYSIS OF CONTEMPORARY INTERNATIONAL RELATIONS

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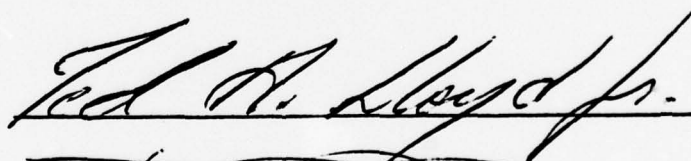
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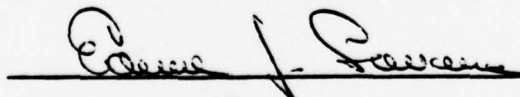
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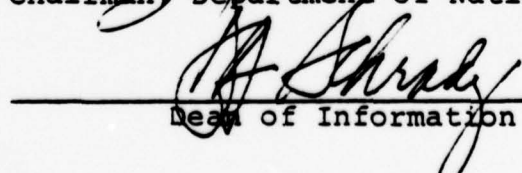


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ABSTRACT

Political analysis must keep pace with rapidly changing, ever more complex international relations. This thesis suggests that a systematic study of the nuclear energy issue is one logical choice for comprehensive international political analysis. Nuclear power policies and debates are examined for their ability to reflect current international trends of conflict and cooperation. Nuclear-related events trigger responses over a wide range of issues, permitting an analyst to observe the various courses of national foreign policy in action. As one observes how nations interact in response to nuclear events, patterns are revealed, thus increasing one's knowledge of contemporary international relations. A paradigm is offered to systematize the analysis of nuclear-related events. A nuclear perspective is illustrated by examining worldwide trends on a global scale, European trends on a continental scale, and French foreign and domestic policies on a national scale. The nuclear power perspective serves as a valuable analytical tool with which to chart and interpret trends and events.

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INTRODUCTION

This thesis will examine the systemic role of nuclear energy in contemporary international relations. This examination will produce evidence to show that nuclear energy issues and debates have closely paralleled the major policy issues and debates that form the basis for both foreign and domestic policy. It is therefore possible to gain new insight into the field of international relations from an understanding of the role played by nuclear energy in the formulation of foreign policy.

The question of nuclear energy has become a heated topic in both national and international politics. Although nuclear energy has been debated and analyzed from many perspectives over the past thirty years, certain aspects of nuclear power are often overlooked. Most of the oversights occur for one or more of the following reasons. Nuclear events tend to be studied as independent phenomena without regard to inherent, interdependent linkages. Secondly, questions of national security, and military applications of nuclear weaponry tend to acquire a disproportionate emphasis and consequently dominate much of the current analyses of nuclear power. Third, some aspects are overlooked simply because they are very subtle, very indirect responses to nuclear interactions. Subtlety does not obviate all significance however. Fourth, rapid technological and economic changes demand new perspectives. Older models, systems, and paradigms may no longer

be applicable to recent developments. Therefore, this thesis will serve to acquaint the reader with the complex nature of nuclear energy as a contemporary political and economic issue.

Some narrowing of the thesis topic is necessary. While the military aspect is important, it has been thoroughly developed elsewhere, and will not be the primary subject of this thesis. Furthermore, this thesis will not attempt to prove or disprove the suitability of nuclear energy as a solution to the problem of energy scarcity. However, the post oil embargo search for secure, unencumbered energy has elevated nuclear power into the forefront of domestic and international politics. While some nations have taken a cautious approach to the spread of nuclear power, other nations have shown an aggressive commitment to a nuclear-powered future. Therefore, as nations modify their foreign policy in an attempt to achieve energy independence through nuclear development, they are forced to contend with the foreign policies of other nations who oppose the spread of nuclear power. Nuclear energy may constitute both the force behind, and the source of, politico-economic cooperation and conflict between nations. These nuclear-related interactions form the basis of new international relationships, and are the subject of this thesis.

A broader conceptual framework is necessary to properly interpret recent political developments in international relations. This framework can be viewed from three levels of magnification: global, continental and national. The

world view, the global perspective, is presented in Chapter I, entitled "Nuclear-Oriented International Relations." The global view concerns the worldwide international infrastructure that has developed as a result of suppliers and consumers monopolizing uranium supplies and nuclear power consortiums. This global system exists as a legacy of the OPEC oil cartel and reflects the emergence of new patterns of international relations.

Chapter II will narrow the focus to an examination of just the European continent. The European nations will be studied as they seek energy independence through nuclear power. This will be followed by an analysis of the political and economic relations between these European nations as they are affected by nuclear power. Finally, Chapter II will use the global perspective of nuclear relations to show how nuclear energy has influenced Eastern and Western European economic integration.

Chapter III will complete the examination by narrowing the focus to one European country. France will be studied for its ability to use nuclear energy to enhance its foreign policy. Thus, the broad concepts of international nuclear relations will be presented from a national perspective.

The author believes that by identifying the often discounted ability of national nuclear energy policies to influence international relations on a national, continental and global scale, a new perspective can be acquired. This nuclear perspective will become a valuable analytical tool

to chart and interpret trends and events during the next several decades of international relations.

The following methodology will be used to identify nuclear energy related events and place them in the proper conceptual framework. Current issues require current sources for meaningful trend analysis. Nuclear energy, therefore, will be examined through a content analysis of recent books, periodicals, and newspaper accounts of the issues surrounding nuclear power. Personal interviews with American and French officials familiar with the nuclear power industry are a part of the research design. This thesis deals with events as they existed prior to summer 1978. Any related events that occur after this period can be studied using the perspective and analytical technique identified in this thesis.

It is recognized that much of what is asserted in this thesis about the role of nuclear energy in international relations could also be said about the other energy options. For example, mining and exploration for oil, coal, natural gas and uranium ore involve similar international trade agreements and economic reciprocity. There are also many similarities between solar, geo-thermal and nuclear generated power in the area of advanced energy research and development. However, while one may draw correlations between what is said about nuclear energy and the other energy options, it is the unique ability of nuclear energy to reflect the entire spectrum of energy issues.

It is precisely this all-encompassing characteristic which makes an examination of the nuclear energy option

particularly significant to the political analyst. The issues which emerge from such an examination are significant because they reflect foreign policy questions which nations must resolve as they adapt to the impending energy crisis. Moreover, since nuclear energy policies exist in the mainstream of contemporary international relations, those policies can serve as political and economic indicators to chart the "drift," if not the substance, of political and economic trends.

I. NUCLEAR-ORIENTED INTERNATIONAL RELATIONS

A. THE GLOBAL PERSPECTIVE

International relations are studied from many different perspectives and by several disciplined approaches. However, the impact of nuclear "power," military, political, or economic, has transformed international relations beyond the scope of standard rules for economic or political analysis. A new perspective may be necessary to understand the convoluted nature of nuclear technology and its unconventional ability to influence foreign policy output.

Proper perspective is the crux of accurate analyses. The old parable of the six blind men attempting to describe the true nature of the elephant provides an apt analogy. The elephant was actually the sum of its various characteristics--viewed from a larger perspective. Caught up in the narrower interpretations, the blind men were unable to reach a consensus. The objective then, is to discover as many individual variables, or characteristics of the subject as possible, relating them to form a more comprehensive analysis.

Nuclear technology has introduced a number of new variables acting on the political and economic structure of international relations. These variables appear in the news daily, in many forms. They can be seen as nuclear events - involving weapons, energy policies, resources, technology

transfers, trade or treaty agreements, and terrorism. Each event is related to the other, not so much by the word "nuclear" as by the disruptive effect which that event may have on the world community.

For example, if a nation takes action to acquire a nuclear reactor and the reason is perceived to be that nation's desire to achieve energy self-sufficiency or escape from oil-dominated politics, then traditional analyses are often considered complete. However, traditional analyses ignore certain other aspects of this event, such as commerce, balance of payments, etc. The once clear distinction between commercial uses of nuclear technology and its military application is rapidly fading. This is especially true of the weapons grade plutonium byproduct of the recently introduced breeder reactors. Conventional balances of military power are upset by the potential ability of one state to resort to nuclear weapons in a regional crisis. As these examples illustrate, the real changes in international relations brought about by nuclear technology may be overlooked if analyses of nuclear events are confined to traditional analytical frameworks.

The enormous power of nuclear energy to deter or compel often overshadows its more subtle power to interact in political and economic spheres. David Yergin writing in the Atlantic Monthly says that the interaction of nuclear energy with other factors is often overlooked because we still tend to think that all major nuclear developments will involve

advanced industrial states. However, Yergin points out that one can see the outline of new "atomic alliances" crisscrossing the world. For example, Argentinian scientists are at work in Iran's nuclear program, and Egyptian scientists are being trained at the nuclear facility that gave India its explosive device.^[191:56] Therefore, established paradigms for the study of international nuclear relations must be modified to include the global implications of a nuclear-oriented event.

Additionally, William Epstein, a nuclear advisor to the United Nations, has said that "the production of nuclear arms may not enhance a nation's security since its neighbors will look upon its intentions with suspicion and the nuclear powers will regard its achievement as a destabilizing factor."^[38:3] He asserts that "regional arms races may break out with devastating effects on fragile economies."^[38:3] David Baldwin, in his article entitled "America in an Independent World: Problems of United States Foreign Policy," adds additional factors which complicate the analysis of nuclear events. He claims that energy shortages, involvement of multinational corporations in the nuclear power industry, and the potential for domestic and international prestige will probably enhance proliferation.^[13] In short, nuclear energy events can interact with other political and economic events to create new inputs to international foreign policy.

This thesis presents the argument that the transformation of international relations, by the evolution of nuclear power, has either been ignored, exaggerated to extremes, or

analyzed piecemeal. The following section will show the extent of change in political, military, and economic elements of inter-"nuclear" relations. Next, section C will present evidence that a worldwide interactive network has developed as a response designed to deal realistically with the ancillary consequences of nuclear energy. Finally, a paradigm is suggested to enable foreign policy analysts to study nuclear-related events in a nomothetic rather than ideographic manner. Based on content analysis, the paradigm is put forth as a method of linking the independent variables - things nuclear - with the dependent variable - foreign policy output.

B. CHANGES IN INTERNATIONAL RELATIONS

The political, military and economic aspects of international relations have all undergone subtle changes as nations have adapted patterns of behavior to cope with nuclear technology. One approach to identifying these changes is to look at the new language for foreign policy analysis which the adaptation process has spawned. For instance, it is now common to speak of economic alliances between suppliers and consumers, irrespective of military institutions or political ideologies. A decade ago nations were simply nuclear or non-nuclear. Today these distinctions are not adequate. A nation may have exploded a nuclear device yet is not considered a nuclear weapons state until it possesses the ability to deliver it. Furthermore, even the less developed nations are

being categorized by their "nearness" to achieving nuclear status. Clearly a new language has evolved to communicate this change in "nuclear" relations.

1. New Language

The word "nuclear" invokes bad connotations like the word "cancer." It is hard to distinguish between the nuclear power to build from its power to destroy. The Eisenhower administration tried to give nuclear technology a new look, with its Atoms for Peace Program, but the technology grew faster than man's ability to control its usefulness or application. Today nuclear power is synonymous with political power, military power, and economic independence. Even the original dangers associated with nuclear energy in the scientific sense have acquired dangerous connotations in the political sense--dangers not originally thought about or planned for by the nuclear safety engineers. New terms are used to describe these dangers such as "proliferation," "fast breeder reactors," "waste disposal," "environmental impact," "technology transfers," and "nuclear blackmail." In the last case, a handful of terrorists can, with a few ounces of plutonium, elevate non-state actors to equal terms with the most powerful nations in the world. New terms for explaining the change to international relations must therefore be used in a new framework of foreign policy analysis.

2. Political

The inadequacy of treating the new age of nuclear politics with the standard rules of political analysis is illustrated by the effect of "breeder reactors" on time. Safeguards, designed into the Non-proliferation Treaty, (NPT), have worked well for over a decade by relying on open inspection to signal a diversion from commercial manufacturers of energy to military applications. Once detected, diplomatic pressures by other treaty members were counted on to force the issue to a satisfactory conclusion. However, according to Dr. Joseph Nye, one of Carter's top advisors, breeder reactors provide states with readily available quantities of weapons grade plutonium. This military capability may be used as a last resort by a nation reacting to preserve its national interests in a crisis. "This evolution would leave less time for diplomacy to work in cases where intentions were volatile."^[130:186] Therefore, the time constraint which enabled diplomatic intervention in a previous decade is now gone.

3. Military

The recent constraints imposed on the political interaction of nations by nuclear proliferation are also evident in the military sphere. The state of nuclear weapons technology has recently advanced to the point where the two superpowers, the U.S. and Soviet Union, have had to avoid on occasion direct intervention in crisis situations.

It is SIPRI's belief that "...the nuclear arsenals of the great powers have grown so large as to exceed any conceivable political or military need." [163] Even conventional responses by these nuclear superpowers are considered too dangerous to attempt. Mercenaries or political proxies are substituted for great power interests in places such as Angola and Zaire.

While the United States and the Soviet Union remain hamstrung by their overabundance of military power, several other nations have rushed into the resultant power vacuum to exercise conventional economic and military politics. Just recently, for instance, the world witnessed the major roles of France and Cuba in the African continent.

Other countries such as India, Brazil, and Iran are striving for what is now known as "regional hegemony." [191:54] It appears that nuclear technology has hastened the decline of bipolarity between the super "nuclear" powers and given rise to new independent actions between regional military powers. The immediate threat of nuclear proliferation may shift the focus of military power from the exclusive domain of the five nuclear weapons states to what Daniel Yergin has called a "nuclear weapons crowd." [191:49]

Another change in international relations concerns the Third World's view of nuclear weapons as a way to achieve international recognition. As Daniel Yergin explains:

In the United Nations and many other councils, the Third World countries have been asserting their independence, declaiming on the subject of their equality, and in general, blaming the First World for all their problems. Some of them believe that the acquisition of nuclear weapons is one of the most visible ways to assert their power and influence. [191:53]

According to Ted Greenwood, "Most states with a nuclear potential regard these weapons as a political, not a military instrument by which to exert increased pressure internationally." [66:114] This seems to be the case in Syrian President Hafez Assad's trying to arrange a deal under which his country would obtain nuclear technology from India, which exploded a nuclear device in 1974. Though Syria has signed the nuclear non-proliferation treaty and thus formally renounced any intention of acquiring nuclear weapons, Assad is reportedly convinced that Israel will never bargain for real peace until one of the Arab countries can wage nuclear war. [166:18]

4. Economic

The incentives to maintain political and military parity--despite the rapid shifts in the traditional balance of power brought about by a proliferation of nuclear technology--have created a new worldwide economic order. Norman Fall, in his article "Atoms for Brazil, Danger for All," explains the recent change this way:

Formerly, US domination of uranium enrichment technology precluded the entrance of other nations into nuclear competition. US control of the international market was jeopardized when projected commercial demands for enriched fuel exceeded the capacity of AEC plants, and countries such as Germany were forced to develop and trade experimental technologies for resources. [60:156]

Therefore, nuclear economics, whether in the form of sources of raw uranium for electrical power plants or marketable

technology in the form of reactors, or direct transfers of weapons, is a new force in the study of international relations.

The nuclear economy has developed certain characteristics which require a new pattern for international market behavior. As Tony Benn, Britain's Minister for Energy puts it:

President Carter's new energy proposals confront the massed alliance of the world nuclear lobby. They have different interests and the friction lies where the national interests differ. Britain has lots of oil and coal. Italy doesn't. Saudi Arabia has huge quantities of oil. The United States has lots of uranium. It is not hard to find out why there are differences of approach; what we must look for is common interests.[164:El9]

Interests range from a desire to corner the nuclear reactor market, to achieving energy self-sufficiency. The effect of this competition has been to alter the world's economic structure.

There is evidence to indicate that a shift from an oil-dominated economic system toward a nuclear economic system has already begun. The oil cartels are being watched closely by uranium cartels waiting and operating in the periphery. New collaborative networks have evolved from the group of nations recently made unwilling dependents of oil politics. The haves and the have-nots are vying for position which will maximize opportunities to gain secure sources of nuclear products.

The magnitude of this new world economic order needs to be studied in sharp focus before economic and political policies are enacted. The next section of this chapter will

argue that a nuclear community already exists and is acting as a separate entity with a political life and force of its own. This international infrastructure stands to inherit the legacy of international power and influence which was developed to serve the oil economy.

C. INTERNATIONAL NETWORKS

If the United States were the only country with nuclear technology, the problem of managing the spread of nuclear energy utilization would be difficult enough. But there are already some thirty countries with nuclear reactor programs and at least five other countries with advanced breeder reactor programs. Ted Greenwood has warned, "If enough states go nuclear in rapid succession, the ability of international systems to adjust might be swamped." [66:114] The Carter administration does not believe that nuclear isolationism is possible in today's world. The President has said that, "Planning for the future of nuclear power must be an international effort involving all nations interested in nuclear power, consumers, and suppliers alike." [130:188] The following examples will show that political, military, and economic networks have emerged to deal with the problems associated with a new age of nuclear cooperation and competition.

1. Suppliers Club

The most important cooperative initiative was Henry Kissinger's convening of a "Suppliers Club" [191:62] after

the surprising Indian atomic test in 1974. The club originally included seven nations possessing the capability to export nuclear technology. These supplier nations were later joined by eight prospective consumers during the club's secret deliberations in London.

The establishment of a new international deliberative body like the Suppliers Club illustrates the changing political environment. President Carter, speaking of this change, said last year:

The hour is too late for business or politics, for diplomacy as usual....An alliance for survival is needed, transcending regions and ideologies, if we are to assure mankind a safe passage into the Twenty-first Century. The nuclear community is currently working toward six interlocking agreements with allied, neutral, and communist cooperation in some. Taken together, the prospective accords would form key elements of a new world regime to introduce greater order into all stages of nuclear energy development.[61:6]

Thus, the problem of proliferation, just one of the many aspects of nuclear power, has brought past adversaries together in a new spirit of cooperation. In fact, few other events in recent history have been the source of such widespread agreement between the United States and Soviet Union than mutual concern over nuclear proliferation.

2. Nuclear-Weapons Free Zones

Several quasi-legal political alliances have sprung up to deal with the inability of the established regulatory agencies to control recent nuclear proliferation. The move to prohibit nuclear weapons in Africa was initiated at a

meeting of the Organization of African Unity, where a Nuclear-Weapons-Free Zone (NWFZ) treaty was discussed. The Treaty of Tlatelolco (1967), banning nuclear weapons in Latin America was used as a model for a regional agreement in Africa. William Epstein believes that a NWFZ treaty in Africa might create "new moral pressures" against South Africa's acquiring nuclear weapons.^[38] Such alliances provide the networks through which formal agreements have been modified to fit the changing political environment.

3. Nonproliferation Treaty

The formal Nonproliferation Treaty (NPT), signed by 102 nations, came into force in 1970. (See Appendix) However, this delicate international arrangement failed to prevent a signatory like India from developing a weapons technology on its own. This led to an ad hoc international safeguard system outside the formal multilateral NPT framework. Canada, for example, India's chief source of nuclear technology, unilaterally insisted that India not make nuclear explosives "of any description" within Canadian-supplied facilities.^[137:317] In addition to Canada's unilateral action, the formal NPT system of international safeguards had to be supplemented with economic sanctions. This illustrates the declining influence of the major economic powers.

To handle the problem of the declining influence of the major economic powers in the world today, Zbigniew Brzezinski called for a "New international economic order."

Commenting on this Time magazine noted:

The changes are necessary, he argues, because 'an old-world order is coming to an end and the shape of a new world community is yet to be defined.' The old order, based largely on military power and nationalism, is giving way to "a technetronic age" in which there will be increasing emphasis on economic development and social justice. The old East-West ideological struggle will wane in importance; the North-South struggle for control of vital raw materials will gain in importance.[194:18]

4. Uranium Cartel

Typical of how the international economic order is changing is the evolution of an international network involving uranium ore. Considerable evidence has been uncovered by a federal grand jury, a House subcommittee, and a New York State legislative office's investigations that a uranium cartel has been active since 1972. Time magazine reported that:

The cartel--known as 'the club' to its members--was organized by the Canadian government, initially to prevent what in 1972 looked like an imminent drop in the price of one of Canada's most important export commodities--uranium. The cartel included companies from Canada, Australia, Britain, France, and South Africa, as well as the governments of all those countries except Britain. Gulf Oil, the only known American participant, was represented through a Canadian subsidiary. The group set up a formal headquarters in Paris, complete with a paid secretariat, policy and operating committees, and detailed rules for dividing up markets and fixing prices. [175:96]

This cartel has evolved partially as a response to the OPEC economic monopoly. It is an example of a new network made possible by the shifting economic environment. Robert Pfaltzgraff gives the following explanation of this shift:

In the midst of an international economic recession, the sale of nuclear technology (now a multibillion dollar business) affords exporting countries tempting means of alleviating balance-of-payments deficits caused by higher oil prices and rampant inflation. Increasing oil prices provide an incentive for the exploitation of other energy sources, such as nuclear power, that have become competitive in price.[137:317]

The "Suppliers Club," the Nuclear Weapons-Free-Zone treaty, unilateral political sanctions, unified Third World opposition, and the Uranium Cartel are only a few examples of the many networks which have sprung up to deal with the changes touched on in the previous section. As nuclear technology continues to alter international relations, a new perspective may be useful to monitor the interaction between these networks.

D. A NEW PERSPECTIVE ON INTERNATIONAL RELATIONS

For the purpose of defining and accumulating data about international affairs, the analyst studies the "issues" of "the organizational processes," or utilizes any number of convenient models which serve to correlate the different perspectives. However, nuclear weapons, nuclear industries, or nuclear energy economies too often are studied as separate phenomena. This approach fails to recognize the interdependence of all aspects of nuclear power, whether they be political, military, or economic. The nuclear interdependence described in the networks of the previous section must be examined in a broad framework to account for its various ancillary characteristics.

For example, the acquisition of a nuclear reactor by a developing country may compel a response on several different levels; uranium suppliers may compete to provide the country with raw materials; technology suppliers may try to sell more advanced facilities; neighboring countries may react to this potential power imbalance by entering the nuclear market; and the world community may impose political or economic sanctions to try to reduce the danger of terrorists acquiring the new source of nuclear blackmail. Each event serves as a signal to the other world powers that a political or economic "threshold" may have been crossed.

This threshold can be detected in the reaction of other powers to a nuclear event. The reaction may appear as a press comment, public statement, or official denouncement of the nuclear event, or an expected reaction may be suppressed. A ready source of data about this reaction can be found by studying the nuclear networks that are tied to each other economically, militarily, and politically.

1. A Paradigm is Needed

Because nuclear related events trigger responses over a wide range of issues, they permit the analyst to observe the various courses of national foreign policies in action. Therefore, as one observes how nations interact in response to nuclear events, patterns of diplomacy and interaction are revealed, and these patterns increase one's knowledge about contemporary international relations. What is needed then is a paradigm that will systematize the study of nuclear related events.

A useful paradigm for studying the reactions and interactions to a nuclear event might best be designed as a series of maps, each map representing a different nuclear network. One map might show countries with marketable nuclear reactor technology; a second map would show the members of formal and informal nonproliferation agreements; a third map might show regional military balances of power; and so forth until all the possible interaction networks are depicted by maps. The maps would be used alternately as templates or overlays to show event initiation or response paths. Once the network of interaction is established, changes could be detected by looking for responses within each network. For example, when a country like Brazil signs a nuclear reactor technology transfer agreement with West Germany, the maps would enable the analyst to predict several different reactions. A map of regional power states would help direct the analysis to the more obvious responses. However, to search for reactions to the nuclear event, "Brazil gets a nuclear reactor," beyond the obvious places requires a directive pattern.

The analyst would conduct a "textscan" survey using the key variables that distinguish each network, e.g., "nuclear reactor sales" for one of the economic networks. However, if this paradigm is to have value as a useful predictive tool, the various maps must be related to each other in a visible, as well as theoretical, sense. A nuclear event in one sphere might then provide the kind of information that will help the analyst predict a "spillover" or "burnthrough" effect for a second or third sphere.

2. Five-Step Methodology

In a practical sense, the analyst would direct his scan toward probable ancillary reactions in networks other than the one where the original event occurred. A five-step methodology might be incorporated by the analyst to predict the likely consequences of a nuclear event. Continuing with the example of Brazil, the first step would involve a regional scan conducted in the newspapers of Brazil's Latin American neighbors for signs of military or economic repercussions caused by the event. Next, there should be a worldwide scan of the newspapers of the nations that are signatories of non-proliferation agreements. If the analyst's attention had been focused on these agreements, he might have been able to predict the strong U.S. opposition to the Brazil reactor deal because the Carter Administration has made nonproliferation a major item of American foreign policy. Furthermore, the analyst might expect that any political pressure used by the U.S. to try to dissuade the West Germans from completing the deal would have an impact on the French sale of a similar reactor to Pakistan.

The third area of scan would be a survey of worldwide economic reaction. Here the analyst might detect a renewed effort by the major nuclear reactor exporters in the U.S., Westinghouse and General Electric, to apply pressure on the President and Congress to lift the ban on fast breeder reactor technology. This action would enable the American firms to reenter the overseas sales markets that are now being served by the European competition.

The fourth area to be scanned concerns energy dependency. Here the analyst might consider the ability of Brazil to act independent of oil politics as its nuclear generating power capability increases. A correlation between nuclear energy production capacity and foreign policy might be constructed which would reveal Brazil's dependency on oil decreasing in direct proportion to nuclear power production. But an additional concern for the analyst would be the new relationships which would begin to form as Brazil increased its dependency on the nations which supply uranium ore and reprocessed spent fuel, the nations which transport the radioactive components of the fuel cycle, train the operators and scientists of the Brazilian nuclear industry, and in general, become the new partners of a nuclear-related alliance system.

The final step of the five step methodology used to direct the scan of the analysis is a general content examination of public statements about the particular event. This last sweep through the press should provide the analyst with additional areas for research, areas which in a traditional framework would not be considered relevant to the analysis of the isolated event, "Brazil gets a nuclear reactor." The ability of this analytical approach, and particularly of this step, to monitor changes in international relations will depend on the analyst's disciplined attempt to account for the far-reaching and subtle effects of nuclear-related events. If such procedures as have been suggested are employed, a

broad conceptual framework for the study of nuclear events can contribute to the discovery of a wide range of foreign policy issues and patterns of interaction in international relations.

To illustrate the ability of a nuclear power perspective to detect trends or changes in international relations, this thesis will turn its focus to the European continent. The European continent was chosen to illustrate the analytical technique of the nuclear perspective because the nations of Europe exhibit a diversity of political issues as well as various stages of economic and industrial development. Furthermore, the relationships that have developed between Eastern and Western Europe clearly reflect new trends in international cooperation and conflict which are evolving in the current age of detente. Whereas the European continent will be used to show how the use of a nuclear perspective is a valuable analytical tool, the same analysis could be used for any other continent to produce a similar continental perspective.

II. THE CONTINENTAL PERSPECTIVE

A. THE NUCLEAR POWER INDUSTRY: A FORCE FOR THE FISSION OR THE FUSION OF EUROPEAN RELATIONS

A recent change in international relations has been described as "The Scarcity Society" by William Ophus writing in the book, 'The Silent Bomb' A guide to the Nuclear Energy Controversy. He observed that a major event in 1973 triggered this change:

Historians may see 1973 as a year dividing one age from another. The Shah of Iran raised the price of his oil by 100%. He accompanied his announcement with a blunt warning to the industrial nations that the cheap and abundant energy 'party' was over. From now on, the resource on which our whole civilization depends would be scarce, and the affluent world would have to live with this fact. [133:266]

The effect of this epoch-making announcement was to send the industrial nations of the world into a strange new behavior pattern. Each nation began to exert all the political and economic power at its disposal to acquire and hoard all potential energy supplies. Soon, however, the shock subsided and the world engaged in the avid search for solutions. All nations began to cooperate with one another to combine resources and technology in concerted attempts to acquire the energy reserves each felt unable to achieve by itself. This became particularly true for the less resource-endowed industrial nations of Eastern and Western Europe. When the

dust had settled from all this frantic reshuffling, a new economic order had begun to emerge to deal with "the Scarcity Society." [133:266]

The search for new sources of energy continues today. Failure to discover a safe, inexpensive energy panacea has led the search back to former solutions like nuclear reactors to generate electricity. The nuclear energy option for widespread use had been tabled in the late 1960's for several reasons. It was associated with the dangers present in the current bipolar strategic arms race and the atomic stockpiles that resulted. Nuclear reactors were expensive, impractical, and became the target of alarmist campaigns during the wave of environmental protectionism that characterized the early 70's. In countries like Japan, nuclear power was considered reprehensible. It took the oil crisis to reorient that country's national priorities to include nuclear power as a viable alternative to oil.

The U.S. was in many ways hurt worst by the oil dilemma. The impact of oil shortages was felt not only because of the tremendous American industrial dependence on oil but also because the average citizen found his livelihood threatened when transportation by automobile became expensive. This had the effect of turning the original popular support for environmental programs into outright opposition. At the federal government level, the political constraints caused by oil diplomacy found that U.S. official endorsement for the Israeli foreign policy was anathema to Arab oil interests. Thus the U.S. was one of the first nations to reconsider the

nuclear energy option and to weigh its advantages in light of abundant U.S. uranium supplies and reactor technology.

U.S. leadership in reopening the nuclear question led to profound advances in techniques for producing electricity from uranium fuel. Soon, "closet case" atomic researchers, technology engineers, and uranium suppliers and processors emerged from the shadows to enter the international arena. The oil cartelization legacy was inherited by a new "Uranium Cartel"[113:166] which helped to transform international relations in an orderly attempt to exploit the economic advantages of nuclear energy. The transformation of international relations on a global scale was touched upon earlier in Chapter I of this discussion. However, the international changes brought about by the trend towards a nuclear based energy economy only describe the tip of the iceberg of worldwide international cooperation and competition over nuclear energy.

This chapter focuses the problem of nuclear power relations on the European continent. The initial reaction to the Shah's announcement in Europe, according to Ophus, was "to reduce once proud nation states to behavior that managed, as one observed put it, to combine the characteristics of an ostrich and a flock of hens." [133:266] Soon however, this concentration of highly industrial European nations combined their forces and resources into a coalition of commercial enterprise which exists for reasons beyond the cause of simply achieving energy sufficiency. The effect of these European nuclear consortiums has been to transform the

independent European nation-states into new, influential supranational economic and political entities.

The forces present in this new European economic environment foster both cooperation and competition among the Western European partners. Meanwhile, Eastern Europeans are watching with not only a shared interest in energy independence but also with an interest in economic expansion. Thus the issue of nuclear power generation as well as the newer prospects of commercially exploiting nuclear reactor technology as demonstrated by the Western Europeans is of great interest to the watchful East Europeans.

In some cases the force that binds the West European nations together has grown to include the East European nations as well. This new socioeconomic relationship, promoted by the combined East-West European desire to develop new energy sources free of political constraints, fosters a trend toward a "Pan-European" economic union. Whether or not this trend can survive about the din of politics and superpower intervention is a question beyond the scope of this thesis. However, the effect of a successful West European power industry may provide the light that attracts the moth, the force that brings East Europeans out of the Soviet economic and political sphere of influence into a new Pan-European economy. Furthermore, nuclear power has already provided some West European countries with a measure of independence and self-sufficiency that exists apart from U.S. domination. The following sections in this chapter will explore the rise of the nuclear power industry in Europe to determine the extent it has accelerated the

emergence of a new European economic order. Finally, an argument will be presented that the ability of Europeans to stand alone will depend on their ability to stand together... and the nuclear power adventure is the first real Pan-European experiment. The success of this venture will depend on the nuclear power industry: a force of fusion or fission in European relations.

B. EVALUATING THE NUCLEAR ENERGY OPTION FOR WESTERN EUROPE

Western Europeans are considering several energy alternatives which they hope will enable them to overcome the impending oil shortage crisis. Mr. Guido Brunner, the energy commissioner of the European Economic Community (EC), argues that a community heavily dependent on imported energy (58% in 1976) cannot ignore any new energy sources. He predicts that new non-nuclear sources, such as solar and geothermal power, will account for no more than five per cent of Europe's total energy supply by the year 2000.^[122:49] It is his opinion, then, that nuclear power must be given priority in Western Europe's energy future.

Several European ministers attending the International Energy Agency meeting held in October 1977 in Paris confirmed the predictions of the priority of nuclear power. Though the final communiqué of the meeting favored the curtailment of nuclear power, a number of countries disassociated themselves from this communiqué showing that most member countries regarded further development of nuclear power as essential for meeting their energy needs in the eighties. A majority of

ministers committed themselves to steady expansion of nuclear generating capacities as the main and indispensable element in attaining group objectives of continued economic growth and lower unemployment.[79:5]

1. The European Community (EC)

The EC has long been convinced that Europe needs a big nuclear program. The community's nine member countries now import 80% of their uranium supplies. By the year 2000, the EC will account for one-third of total world demand for uranium. Last year nuclear power provided only 2.1% of the EC's energy needs, but the EC Commission expects the share to rise to ten percent in 1985 and 20-25 percent in the year 2000.[71:72] The EC, therefore, has backed the development of the controversial fast breeder reactors and reprocessing plants which produce more reusable fuel than they consume. The Commission hopes to rely on the new fast breeder reprocessing technology to cut Europe's dependence on foreign sources of uranium and oil. According to a Ford Foundation study entitled Nuclear Power Issues and Choices:

Approximately 90% of the world's present and planned nuclear generating capacity requires slightly enriched uranium as fuel. The questions of assurance of enrichment services will thus be critical for virtually all nations with a substantial commitment to nuclear power. The major exception to this is Canada, whose reactors use natural uranium. In the past, the United States has provided such services for all countries outside of the Communist world, using enrichment plants built in connection with its weapons program. The Soviet Union provides similar services for its reactors and those in Eastern Europe, and has contracted to provide some enrichment for Western European countries.[161:365]

The drastic reduction of nuclear power development in the United States, a consequence of President Carter's campaign to half the proliferation of the weapons grade plutonium produced by the fast breeder reactors, has caused the Europeans to accelerate their own development of a nuclear fuel production industry. According to a Rand report, Europe's Changing Energy Relations, prepared for the Office of the Secretary of Defense, "By the early 1980's, Western European uranium enrichment capacities will furnish most enrichment services for European reactors, ending Europe's nearly complete dependence on the United States and--in the late 1970's at least--heavy dependence on the USSR." [117:viii]

For OECD-Europe as a whole, nuclear power is going to be, by current expectations, the most rapidly expanding source during the decade ahead. [117:37] Table I shows the projected growth of nuclear power in six Western European countries and the United States.

TABLE I
ESTIMATED NUCLEAR POWER GROWTH, WESTERN
EUROPEAN COUNTRIES AND UNITED STATES
(In billion watts, GW)

Country	1975	1980	1985	1990
West Germany	3	19	45	77
France	2	20	56	90
Italy	1	1	26	62
United Kingdom	5	11	15	31
Spain	1	9	24	42
Sweden	3	7	11	16
United States	40	83	205	385

SOURCE: OECD Nuclear Energy Agency and International Atomic Energy Agency, Uranium: Resources, Production, and Demand, OECD, Paris, 1976. Estimated as of spring 1975.

One of the EC's most glaring failures has been its inability to develop a common energy policy to deal with the coming nuclear energy decade. Despite endless declarations, the Community is little nearer to agreement now than when the oil crisis broke in 1973.[109:175] But one must remember that neither OECD-Europe nor the European Community is a unit with uniform conditions and policies. In particular, energy structures of the individual countries vary, and are subject to different national policy orientations. Thus, in order to understand Western Europe's nuclear energy policies, it is necessary to examine the nuclear policies of the individual states. Through such an examination one notes that elements of cooperation and conflict operate within as well as between these national policies.

The nuclear industries of the West were built with an eye on a lucrative new export market for complete nuclear power stations. That is how it developed in the 1960's with two American firms, Westinghouse and General Electric dominating sales.[48:100] Since then, the mid-1970's recession has sent Britain, France, Germany, Spain, Italy, and Sweden into the development of full-fledged nuclear industries. Table II shows France projected to lead the other West European countries in uranium production capacities through 1985.[117:76] The reason France has outdistanced its Western European neighbors in the nuclear power industry is best understood by examining the way France exercises its nuclear option.

TABLE II
URANIUM PRODUCTION CAPACITIES AND WORLD URANIUM
REQUIREMENTS, 1974 THROUGH 1985
(In Thousand Tons Uranium/Year)

Country	1974 (existing)	1980 (projected)	1985 (attainable)
France	1.8	3.0	3-3.5
Spain and Portugal	0.2	0.8	1.0
Sweden	---	---	1.3
Other Western Europe	0.2	0.4	1.4-1.9
Gabon and Niger	2.0	5.2	7.2
South Africa	2.7	11.2	13.8
Australia	---	3.3	>5.0
United States	13.5	25.0	40.0
Total production capacity, estimated	25.1	60.0	87.0
Free World uranium requirements, estimated	18.0	48-53	88-101

SOURCE: OECD Nuclear Energy Agency and International Atomic Energy Agency, Uranium: Resources, Production, and Demand, OECD, Paris, 1976, pp. 25 and 32.

2. France

France's nuclear program dates from the days of the Fourth Republic and was enthusiastically embraced by DeGaulle as part of his desire to develop an independent atomic strike force. The program accelerated in 1974 after the rise in the world oil price, as illustrated in Table III. Officials envisioned the installation of nuclear plants that would cover about 20% of France's energy needs by 1985. [117:48]

TABLE III
FRENCH ENERGY CONSUMPTION, 1974 AND
1975 ACTUAL AND 1985 PROJECTIONS
(In Million Tons Oil Equivalent)

Source of Energy	1974 (actual)	1975 (actual)	Projections for 1985		
			Project- ed in July 1975	Projected in March 1976	
				"Hard Core"	"Adjust- able Supple- ment"
Coal	32	28	30	25	
Gas	16	17	37	37	
Oil	112	102	96	98	
Nuclear elec- tricity	3	4	60	55	13
Hydroelectric	13	13	14	14	
New energies	--	--	3	3	
Total	176	164	240	232	245

SOURCE: Rapport de la Commission de l'énergie du VII plan, Paris, 26 March 1976, pp. 5 and 30.

The overall French program has since been scaled down due more to the pressures from the growing antinuclear movement throughout Western Europe than to a lessening of the French government's commitment to nuclear energy. Supporting this conclusion is the fact, reported in The Economist, that:

France sent more delegates to the May 77 International Atomic Energy Agency (the UN spin-off) conference in Salzburg than any other country. More in fact, than the United States and Russia put together. The large size of the French contingent reflects its bullishness on nuclear power. [9:100]

A key element in the government's program has been breeder reactors. Their attraction is twofold. By producing

more fuel than they consume, the breeders, at least theoretically, would cut down dependence on uranium imports, and officials expect to use France's lead in the field to carve out a lucrative slice of the overseas market.

The export earnings from nuclear technology were supposed to defray the mounting costs of petroleum imports. Three years ago, the French began to push the sale of reactors in the Middle East, Pakistan and South Korea. The French government has been unwilling, so far, to forego export opportunities for its powerfully organized nuclear industries. In fact, the government, especially the semi-autonomous Atomic Energy Commission, played an active role in initiating several of the export deals.

The engineering firm, Framatome, now principally owned by the government's Atomic Energy Commission and largely purged of its connection with Westinghouse, also occupies a prominent position. Together with Alsthom and the Compagnie Electro-Mecanique, it forms the French industrial group that goes out for export orders. These French industrial groups have cooperated with other Western European industrial groups in some areas, e.g., the development and export planning for fast breeder reactors. [117:76]

Framatome currently has the capability to produce seven or eight Nuclear Steam Supply Systems (NSSS) per year. The domestic market will probably absorb five per year, so Framatome is trying to sell two or three NSSS's per year to foreign countries. [81:793]

European correspondent Fernand Auberjonois reported that France's energy situation calls for the most ambitious nuclear power program in the West. She depends on imports for 75% of her energy needs. The search for offshore oil in territorial waters has not been rewarding, so far, and France's coal deposits are much smaller than West Germany's or Britain's. Her natural gas reserves in the southwest, now fully tapped, are expected to start running down in about six years.[10:10]

The decision to go nuclear on a very large scale was made shortly after the fourfold increase in oil prices in 1973. The government adopted an ambitious program calling for the construction of 50 nuclear power stations of 1,000 megawatts each by 1985.

According to Auberjonois, the opposition to the government's accelerated program emphasizes the safety factor far less than another problem which the public fears more: "giantism and overemphasis. France has moved too far from the rural to the industrial age, and this fairly recently. The people have not accepted the change. Hence the protest. And the nuclear power plants have become a symbol of giantism.[10:10]

Nevertheless, the French Government has withstood the onslaught of the opponents of nuclear energy better than most other Western European governments. To deal with domestic opposition, the government has tactfully avoided the debates and instead played up the economic benefits to the industrial sector. A day before a rally against a proposed reactor site in Creys-Malville, President Valery Giscard d'Estaing chose to

visit a nearby uranium-enrichment plant to assert his commitment to nuclear programs. In the aftermath of the violence, officials sought to inject an element of nationalism in the debate by pointing out that some of the protesters were West Germans. [10:10]

3. West Germany

Indeed the most dramatic demonstration of the pressure from opponents of nuclear energy has taken place in West Germany--one of the Western European nations with the most advanced programs. Twenty-two years after West Germany first gained access to atomic power, the government is involved in bitter debate with industry and environmental groups over the future of nuclear energy in this densely populated industrial country. Despite widespread public resistance, Chancellor Helmut Schmidt's government says it is determined "to keep open the nuclear option," including the possibility of plutonium-fueled fast breeders. [20:11]

West Germany is in a different position than France because the Germans have no uranium of their own and are therefore totally dependent on imports. Consequently, the West Germans have felt the need to pursue the breeder technology to gain independence in the face of possible energy shortages. [20:11]

In West Germany, the Kraftwerk Union (Kwu), a joint affiliate of Siemens and AEG-Telefunken is the centerpiece of the nuclear equipment industry and the principal promoter of exports. German critics have charged the Bonn government with

looking the other way while nuclear industrialists, subsidized with large government research and exploration funds, prepare export deals that may assist weapon proliferation.[117:76]

In 1975 West Germany contracted to sell Brazil a uranium enrichment plant and a nuclear fuel reprocessing facility, both of which could be used to produce materials for atomic weapons. American reaction to this proposed deal put pressure on the West Germans to cancel on the grounds that in the rush for markets the security implications may have been swept aside. Meanwhile, the Germans are withholding final approval for the export of the "sensitive technology" part of the Brazilian deal.

4. Sweden

Sweden originally shared the French and German commitment to the nuclear option. In the late 1960's, the Social-Democratic government decided to build 11 nuclear power plants (capacity of about 6000 MW by 1982). During the oil crisis, it raised its sights to 24 plants by 1990, with construction of the 13 additional plants due to begin in the 1980's.[117:49]

By 1975, Sweden had five nuclear plants in operation, with a combined capacity of about 3200 MW, and one plant about ready to start. Then came the elections of September 1976.[117:50] Environmental opposition to Sweden's nuclear program was believed to have played a key role in turning out the Social Democrats, who had been in power since 1932. The Center party that had campaigned for stopping all nuclear electricity generation in Sweden on environmental grounds also lost votes, but in coalition

with the Liberals and Conservatives, both supporters of the previous government's nuclear program, the Center was able to lead the new government. The coalition apparently compromised by continuing the operation of the five existing plants and starting up the sixth, but delaying the activation of two others from 1977 to 1978. This compromise also stopped construction of the three remaining plants until a review by a royal commission (and possibly a referendum) confirms the program .[117:50]

5. Italy

In contrast to France, Germany and Sweden, Italy has not yet really initiated its ambitious nuclear energy program. Obstacles have hampered it from the start, so the programmed capacity is unlikely to be approached by 1985. This program, calling for more than twenty reactors in operation by 1985 appears to be endangered primarily by soaring costs and the near-paralysis brought on by the internal political crisis.[85:6]

6. Spain

Spain already has three nuclear power plants in operation, one built by a French consortium, another by General Electric and a third by Westinghouse. Westinghouse is now working on six reactors on three sites, staggered for completion within periods of six months. General Electric has three reactors on two sites under way.[159:7] Meanwhile, the Spanish government is concerned about the implications of President Carter's new restrictive nuclear policy to ban the use of

plutonium in nuclear reactors. Spanish officials want to know what restrictions, controls, and new costs will be involved for their American-built reactors.

Spain buys its uranium in Niger, Canada, and South Africa and has it sent to the United States to be enriched for use in power reactors. The used fuel rods, which contain plutonium, are sent to Britain for reprocessing.

7. Britain

Britain, a pioneer in nuclear power generation, had 14 power plants in operation by the end of 1974. In the Britain of 1977, the lobby pressing for the fast breeder program, headed by the Atomic Energy Authority has been called "an extremely powerful one, amounting to a military-industrial complex in itself." [141:92]

But Britain's relatively low-key nuclear electricity program is suffering from continued troubles with reactor design. The government's commitment to several British designs, including the steam-generating heavy water reactor, has been strongly challenged on economic grounds by the Atomic Energy Authority. [64:67] In September 1976, moreover, a royal commission on environmental pollution startled the public with a report urging postponement of all further expansion of nuclear energy in Britain until its environmental and other effects had been thoroughly studied. [117:52]

8. The Netherlands

In the Netherlands, opinion polls indicate that more than half the Dutch have doubts about nuclear energy. The government has run into opposition to plans for the construction of three new atomic plants and the burial of nuclear wastes.[85:6]

Both for financial reasons and for domestic political considerations, the Dutch government has sought to carry out its breeder reactor plans as part of a joint program involving France, Belgium, Italy and West Germany. The extent to which Western European countries have had to pool their efforts to reverse the downward trend faced by troubled nuclear energy programs will be discussed in the next chapter. It should be clear, however, that the decision to choose the nuclear option in Western European capitals, has been a force of both fusion and fission in domestic-European relations.

C. WESTERN EUROPE COOPERATES TO GENERATE

The nuclear power industries in Western Europe have combined forces and resources to overcome the recent slump in domestic nuclear power production and export sales. Nuclear power in Europe entails its own import dependencies, however. Except France, no Western European country has so far found and developed uranium deposits on its own territory adequate for fueling a significant number of reactors; and so far none is capable of providing uranium enrichment services for the fuel supply of civilian power stations.[117:38]

Naturally then, the industrial nations of Western Europe, along with Japan and the Soviet Union, have been united recently by their hostility to the Carter plans for a new agreement that would virtually ban the manufacture, use or sale of plutonium and the equipment that produces it.[105:A9]

The West European countries realize, however, that successful development of the plutonium-burning fast breeder reactor is their principal hope of obtaining adequate energy supplies. Sharing this interest, they agree that Carter's attempt to ban plutonium is unrealistic for countries with small energy resources.

Underlining the Europeans' determination to continue with the breeder, France, West Germany and three other Common Market countries have pooled resources for research, development, licensing and construction of liquid-sodium-cooled fast breeder reactors. The industrial cooperation agreements followed statements by French President Valery Giscard d'Estaing that the fast breeder was an "indispensable part of France's energy program." [40:12] The industrial cooperation agreements are accompanied by other inter-European accords to formalize the relationships that are developing in the joint pursuit of energy independence through nuclear technology.

Under the European accords, France and West Germany will be shareholders in a joint company called Serena that will hold license to all fast breeder know-how developed by the two sides separately or together. The French breeder engineering firm Novatome and a West German-Belgian-Dutch breeder builder will pay licensing fees going back to France's

Commissariat à l'Energie Atomique (CEA), the leader in developing fast breeder technology, during the first years of breeder commercialization. Belgium and the Netherlands have a share in Serena on the German side, while Italian participation--now limited to licensing agreements with CEA--is likely to be formalized in the near future.[40:12]

Supplementing the industrial side of breeder cooperation is a Franco-German research and development cooperation agreement that links German's Inter-atom and Karlsruhe Research Center on one side with CEA on the other. This program will cost around one billion francs (\$200m) a year for the next few years shared by the two sides.[75:116] The agreement grew out of negotiations last year when the French and West German governments decided to combine forces in a \$170-million research effort.[40:12] Through these agreements France and Germany made clear their commitment to the rapid commercial development of fast-breeder reactors, and the widespread use of plutonium as a fuel.

Both sides consider the possibility of joint exports to be one of the main incentives behind the agreement, although each side will technically be free to embark on export deals alone.[40:12] For example, both France and Germany have recently signed nuclear export contracts with Iran. The French contract is worth up to \$3 billion dollars for two 900-megawatt nuclear power plants and a ten year supply of enriched uranium fuel. At the same time, a West German company is building Iran's first two nuclear power plants of 1200 megawatts each. They are expected to be in operation

two years before the French-built plants are commissioned, one by the end of 1983 and the other in 1984. [53:5]

The possibility of other countries taking licenses under the French-German agreements has not been ruled out. Other existing accords create a company, including French, West German, Dutch, Belgian and Italian interests, to market breeders.

One argument made in favor of such cooperative ventures stresses that Western Europe holds a technological lead over the United States. Officials say the Americans will probably come around to accepting the inevitability of breeders, and Europe should be prepared to meet its needs and seize a share of the export market. [87:6] Thus Western European nuclear cooperative production efforts are not likely to back down in the fact of American diplomatic pressure for nonproliferation.

In spite of fears concerning the effects of Carter's proposed plutonium restrictions, the Western European governments still support the U.S.-led drive to curb the spread of nuclear weapons inherent in breeder reactors exports. They stress, however, that new restrictions should be "negotiated internationally and take into account commercial considerations." [102:16] Last year the International Atomic Energy Agency, based in Vienna, (I.A.E.A.) completed a two year study of multi-national recycling centers as a way to achieve greater economy and minimize proliferation. Such centers would, it has concluded, be most economical if they handled fuel from plants generating 30,000 megawatts. That is almost half the total production of all nuclear plants in the world.

The proposed centers would be set up on a pay-as-you-go basis by private industry under international supervision. The report noted that if such an international approach were to replace the current trend toward national recycling centers, then early political action would be necessary. [120:4]

The proposed multi-national recycling center failed to materialize. It seems apparent that cross-national cooperation for nuclear power production has not progressed beyond the commercial agreements which exist between the separate national industries. Prospects for formal political agreements between these nations are currently unfavorable in light of the unwillingness of most governments to subjugate their individual economic interests and national sovereignty to an international regulatory agency.

A typical example of the unwillingness of Western European countries to submit to international control involves France's opposition to two EC nuclear deals. One concerns the site for the Jet (Joint European Torus), a big experimental device which would be one step on the road to fusion energy. The other concerns nuclear safeguards to be applied by the Euratom countries (the same Nine as the EC states.) [59:32]

The dispute over the Jet site has been going on for over a year. Everyone agrees that fusion could well provide the cheap, inexhaustible energy supplies of the future. But they disagree totally on where to put the device. An independent committee recommended Ispra in Italy. Germany, however, wants Garching near Munich, and Britain is pushing its site at Culham. Eventually all seemed willing to accept a majority

verdict on the site except the French, who insisted on their own research center at Cadarache. When pressed for an alternative, they suggested the Cern laboratories near Geneva, not even in the community. Jet may now be dead as a community project.[59:32]

French resistance has also upset efforts by Euratom to regulate its relationship with the International Atomic Energy Agency. The I.A.E.A., the watchdog of the nuclear Non-Proliferation Treaty (NPT), [191:58] sends inspectors to countries which have ratified the pact to make sure no one is making a bomb. But France, which has not signed the NPT, turned the regulation down, worried, it appears, about having the NPT procedures imposed on it by the back door.

Cooperative efforts by Western European nuclear power industries have deteriorated under several pressures: political bickering, national jealousies, economic selfishness, diplomatic restraints from the U.S., and a rising international group of outspoken environmentalists. This is in sharp contrast to the nuclear energy policies of Eastern Europe. Paul Hoffman reported in a New York Times article about Soviet plans for a plutonium-based economy. He reported that the Soviet Union and allied countries expected to see fast breeders supplying 50% of their nuclear power engineering requirements by the year 2000.[74:8] Furthermore, according to Hoffman, instead of the environmental dissension which has plagued the West, "the scientific, technical and economic planners of Eastern Europe are convinced that nuclear power plants 'contribute to the environmental improvement,' and appear to

have no misgivings about the use of plutonium as a nuclear fuel.[74:8]

The East's commitment to fast breeder reprocessing technology has suddenly become significant to Western Europe. While Western nuclear reactor programs stall over the plutonium issue and the U.S. and Canada have imposed an embargo on uranium in support of Carter's fast breeder technology boycott, the Soviets have become the single most important source of uranium enrichment services for the European Community as a whole. According to EURATOM data of 1976 as reported in the Rand paper, Europe's Changing Energy Relations, the Soviets will supply more than half in 1977, and more than two-fifths in the two following years, before Western Europe's own supplies take up the slack of rapidly diminishing U.S. supplies, as Table IV shows.[117:45]

TABLE IV
SUPPLY OF URANIUM ENRICHMENT UNDER CONTRACT
TO USERS IN EUROPEAN COMMUNITY

Year	Total Quantity (tsw)	Percentage Share of Sources			
		U.S.	USSR	EURODIF ^o	URENCO*
1976	2,374	74	26	0	0
1977	4,357	45	55	0	0
1978	6,217	45	46	5	4
1979	8,809	33	42	24	1
1980	12,467	27	28	35	10

* URENCO is a joint British, Dutch, West German organization with plants in The Netherlands and the United Kingdom.

^o EURODIF is a joint venture involving France (52%), Italy, Belgium, Spain, and Iran, which is building a gaseous diffusion plant in France.

SOURCE: Rand Report R-2086-15A.[117:45]

European overtures to the Russians have been greeted with tacit approval by the United States. Washington even permitted shipments of American uranium to the Soviet Union for processing into nuclear fuel destined for West German power plants.^[117:46] Washington did not fear unauthorized procurement of this weapons grade fuel because Soviet control over its nuclear industries is effective. For example, all spent fuel for Soviet-supplied reactors in Eastern Europe must be returned to the USSR. American, Canadian and French controls of the fuel cycle in their customer countries have never been so tight.^[117:75]

The net result of this interim fuel enrichment contract with the Soviet Union is to shift Western European nuclear power industries into a new dependency on the East. How long this dependency lasts will depend on how quickly the European Community can overcome the recent forces of dissension which currently threaten their initial cooperative successes. It is paradoxical that fast breeder reactors were endorsed by Western European industrial nations as the economic means by which they intended to wean themselves from an American dependency; a process which resulted in Soviet dependency.

On the other hand, temporary cooperation with the nuclear industries of the Soviet Union and its Eastern allies could develop into new opportunities to revive the foundering nuclear prospects in the West. For instance the current program designed to expand the export capabilities of the Western nuclear consortiums should reach fruition about the same time dependency on Soviet enrichment ends. Since both Eastern and Western European countries are seeking the same

independence from Superpower economic hegemony, a combined cooperative effort in development of the nuclear option is not only possible but probable.

This section has examined the successes and failures of Western Europeans to combine their nuclear power policies into corporate alliances to achieve both energy independence and commercial success. The next section of this chapter will examine the aspirations of the Eastern Europeans as they elect the nuclear options and the political and economic restraints which hinder their progress. The nuclear power industry will then provide a "benchmark" to assess the forces of fusion and fission in Eastern European relations.

D. PROSPECT FOR COOPERATION AS EASTERN EUROPE CHOOSES THE NUCLEAR OPTION

Eastern Europe and Western Europe began putting increased emphasis on the development of nuclear power at about the same time. However, in East-Europe, this was not a result of the Arab oil embargo as much as it was due to the approaching depletion of oil fields in European Russia. Romania also, for the first time, conceded that its oil fields were being depleted.

East Europeans look eastward towards the Soviet Union for their energy needs including nuclear technology. In 1977, Moscow announced that new nuclear power plants would be built in Bulgaria, Czechoslovakia and Hungary in addition to those that are already operating or under construction. Poland and Romania would also be equipped with their first atomic reactors

as part of this new emphasis on nuclear energy. Under the present program, the Eastern bloc's share of nuclear produced energy is projected to rise from three percent of all electric energy to seven percent by 1980.[73:8] Unlike the West, the Eastern European nations have no powerful antinuclear lobbies to contend with in making their plans for alternative energy sources.

1. INTERATOMENERGO

The nuclear power programs of the Soviet-bloc Council for Mutual Economic Cooperation are now coordinated from a central agency. This agency "Interatomenergo" is carefully watched by Moscow. In fact some Western analysts feel that a major reason why the Soviets are keeping Czechoslovakia under such close military and political control is its importance as a prime source of uranium.[73:8]

The political pressures that have stalled the recent I.A.E.A. efforts to provide international control for their shared nuclear resources and technology do not exist in the East. For example, the East bloc has pooled its uranium resources, consisting of mines in Czechoslovakia, Poland and the Soviet Union. Some of the smaller East European countries build components for the joint reactor projects. Czechoslovakia furnishes high pressure vessels and Poland supplies steam generators.[73:8]

The apparent ability of the East Europeans to cooperate to generate nuclear power is marred by the forces of nationalism and economics. The national forces that plague the Soviet

bloc have always existed, but the economic forces are new. For example, Paul Hoffman reported in another article entitled, "East Bloc Puts Increasing Emphasis on Nuclear Power," that "the smaller East European countries are under pressure to look for the alternative energy sources--mainly nuclear plants--because the Soviet Union clearly prefers to sell surplus oil and gas to hard currency nations." [73:8] This search for nuclear plants has caused the East Europeans to look to the export motivated nuclear industries of the West.

2. Romania

One East European country taking an active interest in Western nuclear reactors--including the highly controversial fast breeder type--is Romania. [23:8] There are three reasons why Romania should be the first to initiate this cross-bloc request for nuclear technology. Under President Ceausescu, Romania has launched an industrial program to make Romania an economic leader in Eastern Europe by 1990. Secondly, Romania became the first Comecon country to establish direct relations with the EC in 1972. A third reason why Romania has led the others in this search for Western nuclear reactors was presented by Malcolm Browne in his New York Times article, "Rumanian Trade--Troubled Growth:"

Since Romania was granted most-favored-nation trading status (partly because it was considered to be allowing an acceptable number of Jews to emigrate), it has also been eligible to import somewhat more American technology than the Soviet Union. [23:8]

Furthermore, a new long-term agreement was signed by Romania and the U.S. in November of 1976 which provides for closer cooperation in economic, scientific, technological and industrial fields.[23:8]

Perhaps the most significant example of Romanian overtures towards economic cooperation with the West can be seen in the negotiations on nuclear cooperation which took place during 1977 between Canadian and Romanian officials. An agreement was signed between the two governments calling for "Cooperation in the Development and Application of Atomic Energy Peaceful Purposes." [25:124] The Canadian Department of External Affairs has said that this nuclear-safeguard agreement, signed October 24, 1977 in Ottawa, would lay the foundation for other agreements that are expected to lead to the purchase of Canadian nuclear technology and equipment by Romania. [25:26]

The prospect of Romania acquiring nuclear technology from Canada is significant to this thesis because it demonstrates the ability of the nuclear power issue to reflect current trends in international relations. For example, the Canadian government has also reported that:

In addition to conducting the nuclear negotiations, Romanian Deputy Minister of Foreign Trade, Constantin Stanciu, came to Ottawa in July for the annual trade consultations between the two countries. The Romanian Vice-Minister of Foreign Affairs, Vasile Gliga, visited Canada in October for consultations on bilateral and multilateral issues. [25:26]

While some Eastern European countries are more active participants in East-West dialogue than others, the implications of

the current cross-block negotiations can best be assessed from an historical perspective.

3. Roots of Dissension

The historical foundation for the current relationship between Eastern Europe and the West starts with the rebuilding of Europe after World War II. Eastern Europe was unique in this process. Nations acquired new regimes and these regimes have been the subject of ideological dialogue ever since. Professor Steven Garrett, addressing a Naval Postgraduate School seminar in Soviet-European Affairs, commented that East Europe was looked upon as being the cause and symbol of the Cold War. The original post-war policy used by the West towards Eastern Europe was characterized by economic boycott, based on a rigid policy of containment.^[203]

The Cold War struggle was as much economic as it was political. Two economically devastated areas were trying to rebuild using different and competing economic ideologies on opposite sides of the Iron Curtain. Steven Garrett has noted that in Western capitals it was hoped that the aggressive, expansionist actions by the Soviet Union would be hampered in that the Soviets would be forced to divert a share of their resources to help sustain Eastern Europe during the post-war rebuilding.^[203] The political success of struggling Communist government in East Europe was hampered by their economic backwardness and the Western policy of economic non-cooperation with the Eastern European Communist governments which had been adopted as a weapon in the Cold War. The

ironic result of this policy has been to reinforce Eastern European economic dependency on, and hence political affinity with, the Soviet Union.

Professor Vernon Aspaturian has characterized world politics during the Cold War as colonial in nature. Eastern Europe, then, was the object of great power diplomacy rather than an actor in it.^[201] Today, however, a new policy is emerging towards Eastern Europe as a result of three important realizations. First, it was realized that an East-West boycott was self-defeating because of the natural European propinquity of markets and culture. Second, the use of the boycott as a weapon was derived from the tight bipolar political mind set which no longer applied.

The third realization by the West was that the world was witnessing a revival in Eastern Europe of anti-Soviet nationalism. This nationalism was producing new centrifugal forces that were straining against the artificially imposed economic dependency on the Soviets. General Sir Harry Tuzo commented in a 1977 RUSI Journal that:

Strains among competing Marxist centres are accompanied by increasing strains within them. Today in Eastern Europe, for example, we are observing the development of centrifugal pressures which are a product, among other things, of both suppressed nationalism and rising and unrequited socio-economic expectations. We cannot know in what way, if at all, these pressures will seek release. [173:1f]

It was felt that a revised Western economic policy of cooperation towards Eastern Europe would encourage these governments to decrease their economic ties to the Soviet Union. Thus,

new economic and diplomatic dialogues have resulted in new commercial enterprises. For example, concerning EEC-Yugoslavian relations, a top-level EEC delegation visited Belgrade in December 1976 and signed a solemn declaration with the Yugoslav government in which both sides promised to "strengthen, deepen and diversify" their cooperation.[82:53] An article in The Economist reported that "There is hardly a Eurocrat in Brussels who does not want to help that plucky Balkan country keep its independence from Russia when Tito goes." [82:53]

4. Prospects for Change

Today the world is witnessing a growing trend towards Eastern European self-sufficiency, both as a region and as individual states. As this self-sufficiency increases in direct proportion to increasing Western commercial participation in Eastern Europe, it permits greater freedom for Eastern European governments to maneuver for future independence from Russia. Furthermore, it tends to shift the focus of Eastern European economic interests westward. An example of this trend is Ceausescu's announcement in 1970 that Romania was prepared to enter into "joint-venture" arrangements with the West, as explained by Malcolm Browne:

Romania, like a number of other Communist countries, has been particularly interested in developing "joint ventures" in which the host country and a foreign investor jointly operate a new corporation. They work out details of profit repatriation, corporate control, marketing patterns and so forth on a case-by-case basis.[23:8]

Nuclear energy, more than any other commercial venture, offers the greatest potential to achieve the goals of a liberal East-West economic policy. In the first place, nuclear energy represents the single greatest commitment of technology, resources, capital and environmental considerations in return for the greatest potential to increase one's own industrial base. Secondly, it promises to solve the acute problems of energy dependency; the single most important factor that ties the East Europeans to the Soviet Union. Thirdly, the acquisition of nuclear technology promises to accelerate the transformation of East European LDC's (lesser developed countries) into major international actors, automatically making them members of the international network of uranium suppliers and consumers.

As each Eastern European country achieves nuclear power status it will attain greater prominence within international conferences such as the NPT and the Suppliers' Club.^[191:62] A more active role within these organizations will further benefit European economic development in two ways. First, the new nuclear powers will be viewed as favored clients or prospective customers to encourage them to become acculturated into Western European economic and political institutions. Aspaturian has observed that once Eastern Europeans become involved, their participation has accelerated their involvement in Western consciousness and economic policy.^[201]

The second advantage of participation in these international conferences is that they provide a forum in which to voice individual nationally oriented foreign policies. The

NPT conference sessions, in particular, have recently provided such a forum. In the past these conferences have been a token arena dominated by the five nuclear weapon states. Today however, outspoken independent policy statements give evidence of the current revival of national consciousness in Eastern Europe. For example, Yugoslavia led the opposition against the inequities of the NPT treaty constraints when at the Review Conference (held in Geneva in May 1977) the delegation stated that Belgrade "would be reconsidering its attitude" toward the treaty because of its imbalance in favor of the nuclear powers.[137:317] This argument was continued in the recent press coverage of Colonel General Ivan Kukoc, member of the Executive Committee of the Yugoslavian League of Communist Central Committee Presidium:

Yugoslavia is interested in the use of nuclear energy for peaceful purposes. In this sense we have been advising and are still advising against any monopoly which member countries of the so-called club of nuclear power are seeking to establish.[193:127]

Colonel General Kukoc explicitly ties Yugoslavian security concerns to the activities of the Suppliers' Club and warns that the government will continue to resist efforts by the nuclear states to establish a nuclear monopoly.[193:127]

Whereas Eastern European countries pursue separate economic policies, successful involvement with the West by a few of these burgeoning nuclear power nations will encourage other countries which are not dependent on the Soviet Union to begin to maneuver on their own. Thus, East-West dialogue over

the nuclear power questions fosters the possibility of new ideological cooperation at a time when political forces of nationalism in the East combine with Eurocommunism in the West to erode Soviet hegemony.

Building new bridges of trade and diplomacy in the spirit of dentente has defined the present policy of trans-European commercial relations. This new European economic reapproachment should appeal both to Eastern and Western Europeans for the following three reasons:

1. European industries are able to operate outside the superpowers' spheres of influence.
2. East-West cooperation achieves economic independence from bipolar political constraints.
3. Trans-European cooperation insures that European commercial interests will remain under European controls.

Whereas present East-West European economic policies have evolved from artificially imposed Cold War politics, the future policies promise to reflect individual national priorities. Many Eastern European countries seek to raise their own technical competence through new ventures in Western technology such as nuclear power. Eventually these rapidly industrializing nations will be entering the lucrative nuclear technology market as commercially viable producers. Their goal will then be to transition as rapidly as possible from consumer to supplier. Thus the nuclear age offers to East Europeans as well as to West Europeans a means for political self-expression and commercial enterprise.

Chances for East-West economic entrepreneurship, especially between the EC and the Comecon, never looked better. The September 18, 1977, meeting in Brussels resumed the long drawn out dialogue between the two European trading blocs illustrating the principles of trans-European economic affinity.

The eastern Comecon countries are not just hoping for political benefits from closer ties with the EC, but are also looking for concessions in their exports to the community. These concessions include easier credit, the harmonization of some quantitative restrictions and the adaptation of the common agricultural policy to allow more East European farm products into the EC.[12:52] The Economist reports that:

Two thirds of Yugoslavia's exports to the community are industrial goods, so high-technology imports can be justified as sharpening the countries' competitive edge in Western markets. Yugoslavia already has about 170 joint venture agreements and around 500 industrial co-operation agreements with western firms, many of them in West Germany. It is now changing its legislation to attract more foreign investors.[12:52]

5. European Detente

The current developments in trans-European economic relationships evolved during the past thirty years from a political process described by Gregory Flynn in an article for Orbis as the "content of European detente." [47:401] This description divides the evolution of European detente into two stages: the 1969-1972 West German Ostpolitik followed by

a second period of East-West negotiations from 1972-1975 aimed at attaining:

"a mutually acceptable set of rules to govern competitive but peaceful coexistence, and to explore possibilities for reducing the role of military confrontation in the East-West relationship." [47:410]

Since 1975 a new era of East-West detente exists based on economic goals rather than political goals. These economic goals are shared by both East and West Europeans. One prominent example of this new era of cross-bloc commercialism is the rapidly expanding trans-European nuclear power industry.

The long standing obstacles that have postponed progress towards diplomatic and socio-economic cooperation between East and West Europeans are rapidly disappearing. Hastening the reconciliation process is the mutual desire to achieve energy sufficiency, economic independence and commercial advantages inherent in a strong nuclear power industry. This section of this chapter has examined the forces that brought East-West relations to the threshold of a trans-European economic order. The next section will consider the prospects of the nuclear power industry reaching Euro-continental proportions. The major obstacle is the political forces affecting East-West European relations in light of the binding influence of nuclear power.

E. POLITICAL FORCES AFFECTING TRANS-EUROPEAN UNITY

There are two versions of Communism in Europe today. First there is the familiar Marxist-Leninist Moscow-sponsored variety

and then there is a new kind which adapts the realpolitik principals of the Western capitalists. The Moscow version has failed to keep up with the national, economic and political forces in both Eastern and Western Europe, and so it has receded in the face of a more viable political alternative. The most recent form of Communism allows the forces of nationalism and Western-style commercialism to exist in a more tolerant and more realistic framework of government than would be possible under Soviet Communism. Marxist-Socialist radicalism which threatened to destroy the hard-earned successes of capitalism has given way to a new willingness to cooperate with Western democratic institutions to achieve national benefits. The benefits of political health through commercial wealth derived from a strong industrial economy are now the expressed principles of the Communist parties of Tito, Berlinguer, and Ceausescu.

Often the characteristics of the emerging Eurocommunist parties are the "out-of-power versions" of their Eastern cousins in power in Yugoslavia and Romania. The current dialogue between these similar political entities has led to increased cooperation between the Eastern Communists and the non-Communist coalitions currently in control of the Western governments. This cooperation is a result of the influence and public support that the minority Western Communists command, an influence illustrated by the fact that the programs offered by the Italian Communists for the solutions to Italy's economic dilemma are often acted upon by the Christian Democrats. Furthermore, the Eurocommunists facilitate

communication between the West and the East. The result has been a climate for East-West conciliation which exists separate and apart from superpower influence.

The French and Italian Communist Parties have recently exhibited their intentions to preserve rather than to replace certain aspects of their national system in spite of the basic tenants of Communist philosophy. For example, the Italian Communists have stated that it is their intention to leave the Ferrari plant in Turin out of their plan to nationalize the industries, acknowledging that this exceptional product contributes favorably to the national image and prestige of the Italian people.

The French Communist Party under Marchais has made similar concessions to the existing French economic and political structure. Marchais recently announced that the Communists have decided to drop their opposition to the French nuclear strike force, the "Force de Frappe," acknowledging that the "Tous Azimuts" defense policy of omni-directional targeting is the only true way to French military independence. Not only do the French Communists voice strong views in favor of the maintenance of an independent atomic military force, but they also echo the government's arguments in favor of the nuclear energy program. Through their labor federation, the Communists have lashed out at opponents of nuclear energy as partisans "of a return to the days of sailboat navies and oil lamps." [85:6]

The conclusion one might draw in examining the tendencies exhibited thus far by these two Eurocommunist parties is that, should they attain full control of their governments, the

changes that might be made would not directly threaten each government's participation in the present nuclear power consortium. One could also expect to see these governments attentive to the same issues that motivate the more liberal and progressive Communist regimes in Eastern Europe. Thus, the encroaching specter of modern Communism, exemplified by the Eurocommunists and certain Eastern European regimes, is far less likely to disrupt the new European economic order than would the Moscow version. How much and in what way the European economy might be affected will be examined next.

The advent of Communist control in France and Italy would have one of two possible effects on the trans-European integration of the nuclear power industry. On the one hand, Communist governments in both East and West Europe would be dealing without the ideological stigmas and political competition that impedes cross-blow cooperation today. This new advantage could accelerate the forming of a European nuclear power industry cartel. This could transform several minor actors into a single new actor of economic and political superpower stature.

A second consideration is the systemic effect that a superpotent trans-European nuclear power industry cartel would have on the U.S., Soviet Union and Third World. Whatever action is taken by the two superpowers to prevent nuclear weapons proliferation will be minimal compared to the reaction of the Third World. Most LDC's would again have to face the realization that they may be trading "petro dependency" for another type of energy dependence; a nuclear dependency on a

commercially united Europe. As long as individual East-West European competition keeps the price of nuclear power export and services down, the non-European countries will pay the price. However, the forces opposing a trans-European commercial advantage would lend support to political forces in Europe trying to prevent this union.

Regardless of the advantages which future Communist governments may have to better integrate the economies of the separate European states, there is one inescapable conclusion. The enormous potential power of the nuclear power industry to generate political, economic and social forces on the European continent is significant. Therefore, one of the more useful indicators of the developing relationships between Eastern and Western Europeans is a study of the expansion of the nuclear power industry.

F. CONCLUSION: NUCLEAR ENERGY DEVELOPMENT AS AN ANALYTICAL TOOL

Developing a nuclear power industry for Europeans by Europeans, and in spite of Europeans has proven to be a monumental undertaking. As this industry develops, it contacts and interacts with the many forces that are used to describe and define East-West and European relations. The forces of nationalism, commercialism, diplomacy, dependency, ecology and politics have all been identified as providing both the allies and antagonists, proponents and opponents, slaves and masters of the rapidly expanding nuclear power industry.

Chapter II has examined European relationships in four settings. First it looked within the major industrial states of Western Europe. Next it compared the national programs that were interrelated in Western European cooperative commercial ventures. These programs were then examined for their ability to cooperate within the context of the European Community. Thirdly, the integrated nuclear industrial programs that unite the participating nations of Eastern Europe were explored in light of the growing commercial detente between East and West. Finally, the political forces in Europe were projected against the prospects for a trans-European nuclear union to forecast the future of nuclear energy should the Communist party come to power.

The broad conceptual framework of the nuclear perspective has served to identify some of the major forces that surface as each European nation exercises its nuclear options. These forces affect the ability of the nuclear power industries to thrive or to just barely survive and can be monitored in the public debates and budget cuts that measure both public and official opinions. The political analyst, observing the expansion and contraction of the nuclear power industry as it responds to the forces it attracts, will gain some insight into these forces and how they affect European relations. Thus the nuclear power industry becomes a measure of the fusion and fission of inter-European relations.

Having identified the analytical role of nuclear power in a global and continental context, this thesis is now ready to turn its focus to the national perspective.

III. THE NATIONAL PERSPECTIVE: NUCLEAR ENERGY AND FOREIGN POLICY

This chapter will explore the role of nuclear energy in international relations from the national perspective. Political analysts can gain insight into the motives behind certain foreign policy decisions made by a nation by accounting for that country's nuclear power policies and goals. Evidence will be presented to show that the nuclear power questions that arise in the daily political life of a country closely parallel that country's foreign policy debates. The analytical technique introduced in Chapter I was used to study the nuclear power policy and debates to determine international trends of economic and political cooperation and conflict. The national perspective which is about to be presented, will show how a single nation can be examined for these same elements of cooperation and conflict.

National elements of cooperation and conflict do not exist because of the international cooperation and conflict generated by nations seeking energy solutions on a global scale. Neither do they exist because of trends toward economic cooperation on a continental scale as seen in Chapter II. Instead, national elements are derived from social, political, and economic elements from within that national society. National elements can be distinguished from the others, for the purpose of this analysis, in their ability to identify that nation as unique among all others. Therefore, a national perspective is necessary

in nuclear analysis so as not to overlook other elements of cooperation and conflict that determine a nation's role in international relations.

The next chapter will introduce the technique of using nuclear power analysis to help determine the current trends of a nation's foreign policy. Before proceeding, however, it will be beneficial to briefly summarize the steps covered thus far in the research design and then to relate these steps to the overall thesis objective, i.e., to examine the analytical role of nuclear energy in contemporary international relations.

Chapter I has described from a global perspective evidence that new systemic effects are produced by a world reorienting itself to a nuclear-dependent economy. These effects are caused by a worldwide international infrastructure that exists as a result of suppliers and consumers engaging in the trade of uranium supplies and nuclear power technology.

Chapter II has presented an analysis of the nuclear power industry's effect on European relations. Nuclear power has acted as a source of conflict and cooperation between the industrial nations of Europe. In particular, nuclear power industries have influenced the trend towards Pan-European commercial integration.

The next logical step is to narrow the perspective of nuclear power analysis to a single nation. The purpose of this step is to determine to what extent nuclear power reflects the major trends of a nation's foreign policy.

The analysis is thus refined by starting with the global perspective (the influence of nuclear power worldwide), re-focusing this nuclear "power" perspective on a particular continent, and then on one particular nation. In this way, the ability of nuclear power analysis to predict foreign policy will be brought into sharp focus. This nuclear-based analytical framework allows the observer to assess a nuclear-related event (as defined in Chapter I) for ancillary consequences on continental, global, and national levels.

The modern French nation with its advanced nuclear power industry will serve to illustrate the technique of nuclear power analysis from the national perspective. The French nuclear power export industry is especially useful as a clear example of how one nation is adapting foreign policy to cope with an emerging nuclear-based economic order.

An examination of French foreign policy vis-a-vis nuclear policy will produce evidence to show that nuclear power exists as an instrument of foreign policy in international relations. This principle will be presented as follows: The French arms trade as it existed in the past decade was used as a major instrument of French foreign policy, enabling France to maintain its political, economic, and military independence. The French arms trade of the past decade will be compared to the French nuclear power export industry as it exists today. This comparison will be made by highlighting the similarities and differences between "arms transfers" and "nuclear exports," in terms of policies, procedures, and objectives. The intent of this comparison is to argue that the French have transformed

a highly diversified nuclear power export trade into a major instrument of French foreign policy. Establishing this parallel will enable the political analyst to relate the current French nuclear policy to the role of French arms transfer policies in the recent past.

The predictive ability of this comparative technique stems from the use of historical parallels. For example, if the question to be determined is whether or not France will transfer controversial technology to a pariah state in the future, the odds are they will. This prediction is based on the fact that both French arms transfer policies and nuclear power export policies have consistently shown this to be the practice.

The question now arises, how close are nuclear power policies and arms transfer policies to the mainstream of French foreign policy? The following chapter will show that the French have actually utilized both nuclear and arms technology transfers as major instruments of French foreign policy. Therefore, the use of nuclear power analysis is indispensable to the French political analyst.

Nuclear power has received greater emphasis in France than in any other industrialized country in Europe. France exploded its first atom bomb in the Sahara on 13 February, 1960 and Charles de Gaulle announced that France was "stronger and prouder since [that] morning."^[191:53] De Gaulle sought to restore the position of France in international affairs by launching upon an independent course as leader of the "Third World" of countries aligned neither with

the Western Allies nor the Soviet bloc. The development of an "independent" French nuclear strike force gave evidence of a French desire to remain independent of U.S. or Soviet controlled defense pacts. France had become after 1965 the world's third most important arms exporter. It was clear that an aggressive arms transfer program was part of De Gaulle's foreign policy to extend French influence into the Middle East and Africa. When French arms sales showed signs of slackening after more than a decade of success, the French turned to their highly developed nuclear power industry for new sources of exports.

By 1975 nuclear power had become international. Thirty countries, in addition to the five nuclear weapons states, had nuclear power plants in operation, under construction, or on order.^[161:6] Today there exists a highly competitive international commerce in reactors, uranium (natural and enriched), and the various supporting equipment and services. The principal suppliers in addition to France and the two superpowers are West Germany, the United Kingdom, Canada, Japan, and South Africa.^[161:6]

The price of nuclear exports is staggering. The cost of a standard-sized power plant in the U.S. for example, is about a billion dollars. The world-wide reactor business will involve several hundred billions of dollars in contracts over the next two decades.^[191:59]

France has entered this market as the foremost promoter of the controversial "fast breeder" reactor.^[135:8] This reactor produces more fuel than it consumes. Unfortunately,

the fuel can be used in atomic weapons. This characteristic has made the fast breeder reactor a target of President Carter's non-proliferation policy. Despite diplomatic pressure, France continues to pursue an aggressive nuclear export policy in a style strongly reminiscent of French arms transfer policies of the previous decade. Is this pattern purely coincidental or has France adapted its successful arms marketing techniques to the nuclear export trade? This thesis will investigate this question.

The next section of this chapter will describe the French arms transfer policy of the past decade and the reasons for the success and then its temporary recession. The reasons for the dramatic shift in emphasis to nuclear power export development will be explained in terms of the growing demand for this new energy source in the Third World.

Section B will introduce the hypothesis that the parallel patterns of the policies, procedures and events that occur in both the French arms trade and the recent nuclear export trade show that the French have superimposed their distinct arms transfer style over the policies that govern and promote the nuclear export program.

Section C will identify the major foreign policy goals of the French government. These national objectives will be compared to the major goals of the French nuclear power industry to illustrate the value of using a nuclear power-oriented approach for a political analysis of France. Section D will extend the nuclear-oriented analysis to contemporary domestic politics.

A. THE FRENCH RESPONSE TO DWINDLING ARMS SALES IS NUCLEAR

The ability of France to compete successfully in the lucrative nuclear power generating export trade stems from the French experience as a major arms supplier during the 60's. This chapter will review that decade in the following areas:

1. The reasons why the French were successful in the arms trade;
2. Unique French sociopolitical advantages;
3. Why, despite these advantages, the French started to lose their competitiveness in the arms trade.

The chapter will also present two explanations for the French entering the nuclear power export market in the Third World. The intent of this chapter is to show how the French arms trading experience made it possible for the French to capitalize on the Third World's demand for nuclear technology.

1. Reasons for Success

France enjoyed a profitable arms trade during the 60's and early 70's, relatively free from superpower competition. Harkarvy describes France during this period as "the jackal state of the arms trade, banking on a commercial policy to intrude into markets held previously by either of the superpowers, and often becoming a preferred supplier for nations not willing to tie themselves either to the American or the Soviet orbits."^[69:68] Thus, France was able to supply arms competitively. There are several reasons for this phenomenon:

1. The US was engaged in the Vietnam War until 1973.
2. The USSR was on a massive rearmament program of its own.
3. The weapons being produced by both superpowers during the past decade were designed to fit their particular defense programs--in the case of the US, jungle warfare, and for the USSR, strategic offense and defense. Therefore, the French were able to tailor their industries and market the armaments sought by the emerging Third World countries.
4. The US and USSR had agreed upon the non-proliferation issues which enabled the non-allied French to market arms free of diplomatic constraints and superpower competition.

Consequently, in the past decade French arms were not only competitive, but were also politically and ideologically free.

Coupled with these French advantages was the fact that a burgeoning arms market was waiting to be exploited by the opportunistic French. This market became available for the following reasons:

1. The Third World became endowed with disposable income from resource exports to industrialized nations.
2. Several Third World countries were engaged in regional conflicts.
3. Several countries were situated between armed camps and hostile neighbors. These countries

sought arms for defense due to unstable political climates.

4. Lesser developed countries (LDC's) were trying to burst out of their technologically backwards condition. Sophisticated arms created the image of technological advancement and contributed to their own technological base.
5. Third World countries favored French arms as a symbol of their independence from major power bloc politics.

For these and other reasons, the French were able to enjoy for over a decade a period of economic success as arms traders.

During this period France received all the benefits of commercial success, including not only international prestige, but also, in the case of French domestic politics, it guaranteed the administration widespread popular support. All this industrial productivity took place during a time when France was building up its own independent arsenals. The export trade helped finance the nuclear "force de frappe." It offset conventional weapon R&D for the French military and insured that the defense production line would stay open to support French forces at home and abroad.

France gained some influence by sending economic assistance personnel to the LDC's only with the weapons for service and training. This technique of personal interaction was not unlike the French colonial policy which was designed to spread French culture through education and language.

The French arms policy during this time was a socio-political

policy designed to regain the "grandeur that was France,"[90] a policy served by the reputation France gained as a major supplier of front line, high technology weapons systems. Obviously, France had more than just sales to lose when the two superpowers reentered the market in that watershed year of 1973.

2. Reasons for Decline

Several events that occurred in 1973 caused the French to reexamine their dwindling arms trade market and to begin to search for commercially viable alternatives. French military orders began to ebb more rapidly after the 1973 Middle East embargo, having already fallen drastically from \$670 million to \$315 million in 1969.[162:259] The US was able to introduce new aircraft of the caliber of the F-14, F-15 and F-16 and to transfer Vietnam War surplus aircraft like OV-10's and C-130's which further hastened the demise of the French arms trade. About the same time the Soviets were introducing high-performance aircraft like the MiG-25 to the Middle East theater which humiliated the air defenses equipped with French supplied arms. French market leverage was being undercut by its former clients as in the case of Israel's attempt to transfer French Mirages to Venezuela. Even more humiliating was the introduction of the Israeli Kfir fighter, made competitive by the Israeli engineers from the stolen French Mirage design.

All these events forced the French to reexamine their arms transfer policies. To prevent the economic collapse of

their industries that depended so heavily on the arms trade, the French did two things. First, they diverted their aerospace and armaments industries into multi-national corporations, combining resources, labor, technology and international sales networks with those of their European partners. Secondly, the French sought to avert economic recession by entering into competition with the US and USSR in exporting the rapidly developing nuclear power technology.

In the past, only the US and Canada had the necessary uranium fuels to exercise control and influence over the sale of nuclear technology. Without the fuel, the technology bought by an LDC was short-lived. Furthermore, this dependency on foreign sources of nuclear fuel inhibited the construction of nuclear reactors in the LDC's. This "fuel dependency" was made painfully obvious during the oil embargo of 1973.

Two things happened which allowed nuclear power production to become economically and politically desirable. First, the energy scarcity tended to silence the opponents of nuclear power production. Arguments made by environmentalists that impeded earlier nuclear technology development in the 60's were blunted by the safety records compiled by second generation reactors in the 70's.

Secondly, the new generation fast breeder reactors, reproducing their own fuel, freed the perspective recipients from the entanglements of uranium dependency. Several industrial countries stepped in to take advantage of the new opportunities to break the superpower monopoly. Of all the

countries that entered the nuclear power production market, France was the most committed.

3. French Nuclear Advantage

France enjoyed certain unique advantages that permitted the French nuclear reactor industry to exploit this burgeoning export market:

1. France did not sign the Nuclear Test Ban Treaty and thus her industry was not restricted from testing and improving upon Western nuclear technology.
2. France had developed and maintained its own nuclear strike force. This provided government support for nuclear research in terms of money and facilities.
3. France had developed nuclear-powered submarines which required the same specialized research program which had helped the US industries produce their commercial reactor technology.
4. France did not sign the Nonproliferation Treaty (NPT) in 1968, and therefore was not restricted by treaty inspections and sanctions. France had free reign of the full range of the world's potential nuclear market. [191:58]
5. France embarked upon its nuclear sales campaign as an established supplier with sales connections which had been developed during the past decade through French arms sales.

6. France had spent a full decade since limiting its military participation in the NATO alliance by establishing itself as a neutral, non-ideological supplier. France was looked upon by the emerging Third World as a successful example of how a country could survive and even thrive outside the bipolar bloc structure. France, therefore, was a symbol of "polycentrism"^[158] which increased its affinity to the developing countries.
7. France had benefited from its experience in the 60's of being able to "deal with wild cards" in a two-handed arms game between the US and USSR. France had been able to capitalize on the markets left unattended by the two superpowers. This same gray market, i.e., embargoed nations, pariah states, etc., was not unfamiliar territory to the French exporting industries.
8. Another reason France was able to compete with the superpowers in the nuclear trade was the effective role France played in the European Economic Community. Joint nuclear production and the sharing of European technology and resources, particularly with West Germany made the French nuclear reactor industry highly competitive.

4. Search for Markets

There are two reasons why France can now implement these unique advantages in a successful campaign to exploit

the world's nuclear technology markets. First, President Carter has halted US fast breeder reactor production because the weapons grade plutonium produced by these reactors could fall into the hands of terrorists. This gives the go ahead signal for the French to capitalize on cancelled US contracts. Dr. Demitri Simes has said, "The arms race was one-sided--the Soviets were racing to catch up and the US was busy reducing--it is easy to win an arms race of this nature." [205] This one-sided arms race principle can be applied to the French nuclear power industry. The French began putting all their industrial strength, marketing analysis and commercial experience behind nuclear energy sales and service at a time when the US was putting political restraints on its own nuclear industry and diplomatic restraints on all other nuclear suppliers. It was easy for the French to win in an energy race of this nature.

The second reason why the time is propitious for French commercialism is that the Third World is emerging in their cultural and industrial evolution ripe for a new energy source. The fact that some LDC's are considered by the US State Department to receive high technology weapons like the F-15 shows their increasing technological capacity. [3:11]

The following is a list of the reasons why the Third World is motivated to acquire nuclear technology. These reasons are strikingly similar to the Third World's reasons for acquiring arms. Nuclear power production is said to:

1. Offer a quick fix that frees the LDC from external energy dependency and political constraints;

2. Promote rapid economic development;
3. Create a favorable balance of payments;
4. Establish new markets for the LDC's rapidly expanding export industries;
5. Insure a major power interest in protecting the LDC's during regional conflicts (one factor working against French reactor sales);
6. Increase the indigenous technological base;
7. Increase domestic security through its ability to enhance popular support for the existing regime;
8. Increase external security by tacitly projecting the image of being able to divert fuel into weapons production during international conflicts;
9. Project big power prestige and status as a member of the "nuclear power club;"[16:1]
10. Convert windfall profits earned in oil economies into social welfare improvement projects (Wide-spread deployment of nuclear-produced electricity is seen by oil rich nations as returning the greatest benefits to quell rural unrest by diverting public consciousness from the unequal distribution of wealth.);
11. Counter the image gained by neighboring rivals to avert regional hegemony (Brazil and Argentina, Pakistan and India, Iran and Iraq, etc.).

The United States and Soviet alignment on the fast breeder reactor non-proliferation issue coupled with a rising

demand have caused the nuclear reactor market to suddenly expand beyond the abilities of the US and USSR to supply the demand. The French, with their socio-political advantages and their ambitious program to offset declining arms sales, have embarked on a successful nuclear power export program with multi-billion dollar contracts extending through the end of the century. [191:59]

This section has provided the reasons why the French have entered the nuclear technology export market following a decade of prominence as an arms supplier. The next chapter will present evidence to show that the French have patterned their nuclear reactor export policies by superimposing their established arms transfer policies.

B. ARMS TRANSFER POLICIES AND NUCLEAR EXPORT POLICIES

1. Presenting the Evidence

HYPOTHESIS: IF...French arms transfer policies, procedures, and events closely parallel the present policies, procedures and events that occur in the French nuclear power equipment export trade....Then...the French have adapted their successful pattern of arms transfers to the nuclear reactor export program.

METHODOLOGY: This chapter will present the results of an examination that compared French arms

transfer patterns to French nuclear reactor sales patterns. The categories which have been studied include but are not limited to political, economic, bureaucratic, military, and diplomatic procedures and events. During the course of the content analysis, certain public statements surfaced and are included for their description of the international systemic effect that French arms transfers have in common with French reactor sales.

CORRELATION

VARIABLES: SIPRI, The Arms Trade with the Third World, 1971, was used to collect twenty-eight statements that describe the French arms transfer policies, procedures and events that characterized the French successes and failures during the 1960-1971 era.^[162] These statements will be compared to published accounts of the present day French nuclear power production export transactions. The intent of this comparison is to identify the distinguishing characteristics of both policies and to highlight their similarities or differences.

FORMAT: When parallel columns are used, the arms transfer comments will appear on the left-hand side and the nuclear transactions on the right. This list will be repeated in summary form at the end of this section. The conclusions drawn from this comparison will demonstrate the validity of the proposed hypothesis.

2. Historical Parallel Patterns

The following examples of arms transfer patterns and nuclear technology transfer patterns demonstrate the French policy to operate independently from Western diplomatic restraints.

Arms

After the US imposed an embargo on India and Pakistan in September 1965, France sold Mirages and submarines to Pakistan.^[162:249]

Nuclear Power

Although the US and Canada has imposed a Uranium embargo on the EEC to emphasize non-proliferation concerns, France sold Pakistan a controversial reactor.^[105:1]

These two episodes helped France maintain its image as a major independent actor.

The following examples show the French willingness to sell to "pariah states" despite diplomatic pressure on the non-proliferation of arms and nuclear technology.

Arms

In August 1963, the UN Security Council resolution called for an arms embargo on South Africa. France abstained and became the main supplier of arms to the tune of \$170 million, roughly 45% of South Africa's total major arms imports from 1961-1969.^[162:268]

Nuclear Power

France did not sign the nuclear non-proliferation treaty of 1968, and has since become the foremost supplier of the controversial fast breeder reactor. "Pariah states" like South Africa and Pakistan are on the list to get French fast breeder technology in spite of international adversion.^[98:1]

The commercial benefits of these controversial export policies are clear. France has taken advantage of the so-called "gray market" for arms and nuclear fast breeder reactors with few competitors. This "laissez faire" export policy for both arms and nuclear reactors has brought political pressure from the United States in an attempt to prevent deliveries of certain equipment. [57:8]

Arms

When the US attempted to discourage Latin American countries from buying sophisticated weapons, France demonstrated its readiness to supply tanks and supersonic aircraft. [162:249]

Nuclear Power

The US State Department is offering A-7 aircraft to Pakistan in return for that country's agreement to pull out of a deal with the French for a nuclear re-processing plant. [155:2]

The French government actively promotes exports which cater to the developing countries.

Arms

The French have emphasized the sale of weapons to developing countries. The 1967 and 1969 exhibitions were held at Satory with special arms displays for developing countries. [162:254]

Nuclear Power

The French favor a maximum development of their nuclear equipment industries, and a strong contribution of these industries to their exports and their entrée as developers into third-world countries. [117:75]

French exports are tailored to meet foreign market requirements.

Arms

The French government has placed emphasis on the design of military equipment to meet foreign requirements. The Mirage 5 has been specially designed for the third-world market. [162:254]

Nuclear Power

To achieve its goal, Pakistan bought a French reactor that did not depend on foreign reprocessing. [78:13]

Also, the French have announced a new nuclear fuel process that does not produce the weapons grade plutonium. Thus it is designed to overcome current non-proliferation restraints on the export of the fast breeder reactor. [104:2]

The French have never been shy about their export objectives. The following examples illustrate the French style of taking advantage of opportunistic situations in both arms sales and reactor sales.

Arms

When the British imposed an embargo on South Africa in 1964, France exploited the embargo to become the principal supplier to that country. [162:249]

Nuclear Power

General Electric was the front-runner to supply South Africa with a nuclear reactor. However, France "streaked past when an embarrassed Republican Administration indicated it would prefer the contract to go to a non-American firm." [8:78]

A similar deal was concluded between France and Iran while American reactor orders were stalled in debate. [8:76]

Illustrating that French opportunism is still alive, the French "snapped up" the vacant space to mount a national exhibit" at the British Farnborough Air Show after the US Department of Commerce did not take up its option on 25,000 square feet. "A sign of the times," says Aviation Week.^[41:13]

SIPRI concludes that "French actions can best be described as those of a country seeking the best available markets without strong political restraints."^[162:249] Although SIPRI was describing French arms transfer policies, the following account of a recent Franco-Japanese nuclear reprocessing contract shows the same pattern of opportunism without strong political restraint: The Japanese got tired of waiting for the lengthy procedures of a British public inquiry into a proposed joint venture with France and Britain to recycle spent fuel so they pressed on ahead with the French half of the deal first.^[146:84] The pattern is clear. The French political climate does not restrain the French from taking advantage of other countries' political constraints. Government support for exports in France can be seen in the following examples of the parallel patterns of arms and nuclear transfers.

Arms

A large part of French armaments industry is government owned. The biggest exceptions are Dassault and Breguet which merged in 1967. There is close cooperation

Nuclear Power

The French nuclear engineering firm, Framatome, is now owned by the government's Atomic Energy Commission. Together with Alsthom and the Compagnie Electro-Mecanique, it forms the

between private and national firms and the sales of weapons are strictly supervised. The Direction des Affaires Internales is primarily responsible for the promotion of weapon exports on the government's behalf. [162:252]

French industrial group that goes out for export orders. Close government supervision is provided by the semi-autonomous Atomic Energy Commission which plays an active role in the initiation of export deals. [117:76]

This illustrates that the French have adopted their successful arms transfer practices of "government ownership," "close cooperation and supervision," and an "active role in promoting exports" to help the nuclear export industry prosper in the 70's. President Giscard d'Estaing emphasized the French government's support for nuclear exports when he chose to head up a committee on the subject himself. [127:53]

One reason for close government cooperation with its arms industry and nuclear industry is the role exports play in maintaining the defense industry as illustrated in the following parallel examples.

Arms

Arms exports are central to the French defense industry: the growth of the industry has been closely associated with the growth of its exports. The role played by exports in maintaining the French defense industry has been stressed publicly. [162:257]

Nuclear Power

French exports of nuclear power plants serve the defense industry in several ways. The capital intensive domestic development of both military and commercial uses of nuclear energy are financed in part by exports. Prime Minister Barre has stressed exports above the problem of unemployment as a primary government objective. [207:PK2]

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The arms industry and the nuclear power industry benefit from export policies that help to defray the enormous research and development costs. The French elected to develop their own nuclear weapons in the early 60's and now have a larger research reactor than the US.[27:11] The export of the nuclear technology which was derived from this defense research and development has enabled the French to defray much of the R&D costs. The practice of using exports to defray the R&D costs is a recurring principle in French Arms transfer policies. To wit:

Arms

South Africa and Israel have both made contributions to French R&D by financing major projects. Furthermore, Israel has provided design modifications for the French defense industry.[162:260]

Nuclear Power

The French have clearly demonstrated an ability to develop nuclear power in an effort to acquire a technical base for a nuclear weapons option.[161:7] Thus exports have contributed to the financing of the force de frappe.

The policy of allowing French arms and reactors to be sold commercially has encouraged the defense industries to produce weapons and reactors for domestic use. For example, the French experience with nuclear submarine developments is similar to the experience of the US defense industry. Like the US, the French commercial reactors are derivative copies of the submarine reactor. In the US, both GE and Westinghouse were eager to capitalize commercially on their experience in the US Navy's reactor program.[191:58] "Therefore, like the US, the establishing, maintenance and development of a strategic nuclear force...is expensive," and thus the future of the

French arms industry depends, to a large extent, on its export potential.[162:258]

The French have often employed the use of joint production of arms and nuclear fuel cycle technology in order to maximize export profits. This policy shows that commercial interests are often more compelling than long-standing hatreds or rivalries arising from war. The origin of cooperation of this magnitude was the Shumann plan which enabled France and West Germany to pool resources of coal and steel to aid in post war economic recovery. The French cooperate to increase France's competitiveness as an arms and nuclear reactor supplier.

Arms

France has undertaken co-production of arms with West Germany, Britain, Italy, etc. Concorde, Transall, Jaguar, Martel, Alpha Jet, and Roland, to name a few, are all co-produced with the French defense industry.[162:258]

Nuclear Power

France, West Germany and three other Common Market countries will pool resources for research, development, licensing and construction of liquid-sodium-cooled fast breeder reactors.[40:12]

The French arms industry shares another pattern of export method with the nuclear power production industry. Both have profited by using the technique of exporting production technology under license, a technique not always used by other arms and reactor suppliers. This method has enabled the two industries to compete in spite of political and diplomatic pressures.

Arms

Although Giscard placed an embargo on most military sales to South Africa two years ago, many of the arms are produced under earlier licensing agreements made earlier with the French. E.g., Mirage aircraft are built under license at a plant near Johannesburg. [107:46]

Nuclear Power

French scientists have developed a new process for nuclear fuel enrichment that does not produce weapons grade fuel. It allows the French to export "do-it-yourself" kits to countries that want to make their own reactor fuel without the danger of weapons proliferation. To date only the French have envisioned the export of nuclear breeder reactors under license. [104:2]

The two methods of transfer, co-production and licensing of production technology, have helped to make French arms and reactors competitive with the two superpowers. The French have demonstrated an ability to break the monopoly held by the two superpowers that had existed in both arms and nuclear reactor export markets.

Arms

The French arms technology of the 60's was able to compete successfully with the US and USSR in almost every area of weapons development. [162:258] Co-production of arms has contributed to "European policy and to breaking the domination exercised by

Nuclear Power

The new French fuel process would break what amounts to a world monopoly of commercial uranium enrichment shared by the US and the Soviet Union. [104:2]

The French refused to support the formalized restraints on future exports

the US in provision of
essential material." [162:258]

of "sensitive materials"
which was advocated by the
US-led London Nuclear
Suppliers Conference. [17:9]

Thus the French hold to their policy of exploiting the market
formally dominated by the US and USSR.

The most striking parallel pattern of arms and nuclear
transfers can be seen in the events following the 1967 and
1973 Arab-Israeli wars. The French were one of the principal
suppliers of Israeli arms in the 60's as well as the designer
and builder of the Israeli research reactor at Dimona in 1964.
The parallel pattern emerged when the French decided to
exchange the Israeli market for the potentially more lucrative
Arab market, first with French arms transfers after the 1967
war, and then with reactor orders after the 1973 war.

Arms

SIPRI explains that the
reason for this shift in
French Arms transfer poli-
cy is "for commercial and
other gains in an Arab
world disenchanted with
Britain and the US and not
satisfied with USSR." [162:249]
The Libyan Mirage deal for
110 French fighters in
January of 1970 is an ex-
ample of the shift to Arab
markets. [162:252]

Nuclear Power

This same pattern was re-
peated for French-supplied
nuclear reactors after the
1973 war. The Iranian
government became impatient
waiting for American reactor
orders and signed a contract
with France for two 900-
megawatt nuclear reactor
plants in 1977. [8:78, 53:5]

These two examples illustrate the French policy of "all-azimuth friendship" with the Arab world.[117:76] This policy was the result of a pragmatic evaluation of the benefits to be gained from courting the Arab market in lieu of what the Israelis could offer. The courtship of the Arabs with arms and reactors has proven to be far more profitable for the French industry than would have been the case with continuing trade with the Israelis. The French have patterned their "pro-Arab, sans Israeli" nuclear export policy after their significant arms policy shift following the 1967 war.

French nuclear reactor sales and French arms sales are considered similar in the minds of some international actors. It is clear that at a meeting of the "nonaligned nations" at Colombo in August 1976, the delegates considered the French policy of arms and reactor exports to be similar. To wit: all the Arab oil countries voted for the resolution to "impose an immediate oil embargo on France (and Israel) in retribution for their arms sales and (French) reactor sales to South Africa." [117:62]

The French have adopted a policy to export nuclear reactors in a renewed effort to gain resources from the Third World, notably South Africa. This pattern originated with the French arms trade. For example:

Arms

In South Africa, an agreement concerning uranium was signed in 1966, simultaneously with the signing of a general

Nuclear Power

Diplomats in Paris say that France's new wider interest in Africa stems from such practical considerations as

arms trade agreement. Also,
French uranium prospecting
is taking place in Brazil
which is associated with
purchases of military
equipment. [162:256]

her need for petroleum and
uranium. This reply came in
response to concern for
French supplied nuclear
plants in South Africa. [140:10]

Therefore, it can be said that the French pattern has been to use arms transfers as well as nuclear reactor sales to secure foreign resources. The pattern is similar. Even the techniques by which foreign markets are secured by French arms merchants are similar to the methods used by the nuclear reactor industry. For example, close military cooperation between the French and the North African states paved the way for future arms purchases when these states reached a level of development compatible with large acquisitions of arms. [162:262] This method of close cooperation worked for the French in Japan. A close association with the Japanese during the designing of the French-built \$200 million plant at Tokai Mura paved the way for the signing of an accord between Paris and Tokyo in which it was agreed that Japan would have its used nuclear fuel reprocessed in a French installation. [135:8] It appears that this close nuclear reactor cooperation paved the way for the reprocessing contract in much the same way that the French military cooperation policy in North Africa led to arms sales. Furthermore, President Carter, in commenting on the Franco-Japanese accord, has predicted that once Japan has shipped fuel to France for reprocessing, other countries will wish to get into the business of reprocessing spent fuel for export. [146:85] Regardless of increasing availability of alternate sources, one can assume,

as evidenced by past French arms export policies, that France will be on hand to capitalize on the nations that follow Japan's example.

The French have an arms transfer policy of providing services and training along with their equipment. This is intended to maintain French influence and to create a continuing dependency on France.[162:262] This practice has been duplicated in the nuclear reprocessing contracts signed by the recipients of French and other suppliers' reactor equipment. The French procedure is to promote reprocessing for all nuclear generating plants in as many countries as it can convince to participate. Thus the need for French support is maintained through nuclear servicing in the same way it was maintained with weapons training and servicing.

One reason the French are able to supply separate reprocessing services for nuclear reactors built by other suppliers is because of the diversified structuring of the nuclear power industry. Each function of the nuclear fuel cycle is marketed as a separate and complete package. This method was designed and perfected by the French arms industry.

Arms

The French arms industry was designed with independent private selling agencies which undertake the promotion of weapon exports.[162:255] Paris maintains an elaborate sales apparatus that has been organized into several

Nuclear Power

The French have designed their nuclear export products to be sold separately. Standard reactors, fuel processors, fast breeder reactors, and fuel reprocessing in French plants, are all packaged and sold as separate

separate agencies, in order to avoid political problems in providing weapons to both sides of a conflict. Thus one French agency can sell arms to South Africa and Israel, while another can show the latest gadgetry to black Africans and Arabs.^[3:12]

export commodities. Thus, the sale of a fast breeder reactor to Iran to process fuel from US supplied plants or reprocessing Japanese fuel used in their home-built plants can be sold as complete transactions.

The French have designed their nuclear export products to be sold separately. Thus the sale of a fast breeder to Iran can proceed as a complete transaction in the same pattern as earlier French arms transfer patterns.

There is a striking similarity between the arguments used to defend the French position on the export of arms to South Africa during the Security Council debate in 1963, and the defense of the French reactor sales to South Africa expressed by President Giscard d'Estaing. Each made the distinction between intended national use and the possibility that the arms' or reactors' fuel might be used for offensive purposes.

Arms

Security Council representative Seydoux declared, "I have specified that the French authorities would take all the measures they consider necessary to prevent the sale to the

Nuclear Power

While admitting that two French-built submarines and frigates were still in the pipeline, the two nuclear reactors which France had promised were designed to meet South Africa's power

South African government
of arms which could be used
for repression" thus drawing
the distinction between arms
for national defense and arms
for internal use.[162:269]

needs, not to boost its mili-
tary potential.[107:45]

There is a common reference to symbolism in both the French arms transfer policies of the 60's and the current reactor policies in the 70's. In the first example, President de Gaulle announced that France would impose an embargo on the aggressor in the Middle East after the June war of 1967. This embargo was selective in that it continued to supply all equipment to Israel except the Mirage because the Mirage was "the symbol of the offensive and its role was very important in the development of the conflict." [162:264] In another instance, the "symbol of conflict" was the French reactor sale to South Africa. Pressure was stepped up by the black Africans to get France to cancel its reactor contract as was stated in The Economist because "the contract was seen as a symbol of the old sin of placing commercial interests above the fate of the blacks." [107:46]

The French have shown in the following two examples that for both arms transfer contracts and nuclear reactor contracts they are prepared to operate under two policies, the official policy and the policy of the industry to honor its commitments. [162:264]

Arms

During the French embargo on the aggressor in the 1967 war, the official policy condemned Israeli actions while the industry continued to supply arms. [162:264] Also, in January 1970, France stated that there would be no sale of Mirages to Iraq. However, Iraq has been receiving French weapons including six Alouettes. [162:257]

Nuclear Power

Although agreeing to an embargo on future exports of nuclear reprocessing plants, the French have continued with delivery of the fast breeder reactor to Pakistan withholding only a portion of the equipment back at this time. The French have stated that they are bound by the previous pledge to Pakistan. [105:9]

France has used the tactic of arms denial and reactor denial when the French have felt that the recipient had taken advantage of the transfer policies:

Arms

The selective arms embargo on Israel became a total embargo after Israeli sailors smuggled five gunboats out of France in 1969. "The gunboat affair represented a defiance of official French policy...." [162:266] When Israel defied the official policy, the second industry policy was clamped down upon. [162:266]

Nuclear Power

This same pattern developed when South Africa was suspected of developing an atomic bomb capability from the French supplied reactors. France became the most outspoken advocate of a complete arms embargo by the West. [52:3]

It seems apparent that the French propensity to sell arms and reactors can be altered by the recipients themselves

faster than by diplomatic pressure on France by other supplier nations.

The final comparison will be made between the transfer modes used for French arms and reactors exports. SIPRI states that there is little evidence that the French government subsidizes arms exports.^[162:255] Reactor sales are also conducted with cash or credit. The line of credit extended for reactors, however, far exceeds the amount available for arms purchases. One can assume that the French are reluctant to extend credit for the arms which in the case of Middle East sales could be used up before they were paid for.

The nuclear power technology and equipment are assured of being long-term assets. What's more, the fuel supplies and reprocessing that will endure beyond the initial reactor sale is a form of leverage to guarantee payment. One may assume that the power and influence gained either through reactor sales or arms transfers are similar in their combined ability to accomplish certain foreign policy objectives sought by the supplier nation. This section has identified the cause of this influence and not attempted to measure its effect. It will be enough to serve the research design of this thesis to merely identify the similarities between the French arms transfer patterns and the nuclear power equipment sales. These will now be presented in summary.

The preceding evidence has shown that French arms transfer policies and present day French nuclear power export policies have followed a parallel pattern. The following list will highlight the similarities of the two policies.

3. Summarizing the Similarities

1. Both policies demonstrate the French pattern of operating independently to maintain its image as a non-aligned actor.
2. Each policy shows French willingness to deal with pariah states despite diplomatic pressures.
3. Both policies have caused the US to attempt to prevent deliveries of certain equipment.
4. Both industries are used by the French government in its policy to promote exports which cater to developing countries.
5. In both industries exports are tailored to meet foreign market requirements.
6. Both policies illustrate the French style of taking advantages of opportunistic situations.
7. Both policies seek the best available markets without strong political restraints.
8. In both industries the government shares a large part of the ownership.
9. The government closely cooperates with both industries and closely supervises each sale.
10. In both industries the government plays an active role in the initiation of export deals.
11. Exports of both arms and nuclear technology are closely associated with the French defense industry.
12. Both export policies are designed to partially defray the large R&D expenses incurred by both industries.

13. Each policy encourages the defense industries to produce products for domestic use.
14. In both industries a policy of joint production has made French exports competitive.
15. Both policies use the technique of exporting production technology under license to circumvent political and diplomatic pressures.
16. Both policies have demonstrated the French ability to break the superpower monopoly.
17. Both policies exhibited a pragmatic approach in their shift from Israeli to the more lucrative Arab markets.
18. Both policies were used to signal the French political policy of "all-azimuth friendship," especially to the Arab world.
19. Both policies have been viewed as similar in the minds of some international actors.
20. Both export policies have been used to gain resources from the Third World.
21. Both policies have benefited from close cooperation with recipients after the transfers, paving the way for future sales.
22. Both policies provide additional services intended to maintain French influence and a continuing dependency.
23. Both industries feature diversified structuring to allow separate sales of each function.

24. Both policies are able to sell separate packages to a diversified market because of the compartmentalized structure of each industry.
25. Similar arguments are used to defend both policies.
26. Common reference is made to symbolism in both the arms transfer policies of the 60's and the nuclear export policies of the 70's.
27. For both arms transfer contracts and nuclear reactor contracts the French have demonstrated that they are prepared to operate under two policies, the official policy and the policy of the industry to honor its commitments.
28. Both policies have used the tactic of export embargo when the French felt the recipients had taken advantage of the transfer policies.
29. Both policies are similar in the modes of transfer. However, the line of credit extended for reactors far exceeds the amount extended for arms purchases.

4. Conclusion

Increased arms exports and commercial activity could be regarded as part of a policy to increase the French political "presence" in the world, to establish France as an international force in the world independent of the two major power camps. [162:260] Indeed, French prestige has increased recently as a result of its ambitious nuclear export policy. The actual degree of influence and power gained as a direct result of the marketing of French nuclear power generating

equipment and service is difficult to measure and beyond the scope of this thesis. However this chapter has served to compare French nuclear export policies to the French arms transfer patterns. The evidence presented clearly supports the notion that the French have adapted their arms transfer policies to an ambitious nuclear reactor export program. The next section will continue to evaluate the impact of French nuclear power exports on the conduct of French foreign policy.

C. NUCLEAR ENERGY AND FRENCH FOREIGN POLICY

This section of this chapter will attempt to identify the major foreign policy goals of the French Government. These goals, stated simply, are to promote French wealth, influence, and culture both at home and abroad. After a more detailed identification of French foreign policy objectives, this paper will focus on the ability of the ambitious nuclear power industry to help the French government promote French wealth, influence and culture in both domestic and international politics. The purpose of this examination is to illustrate the value of using a nuclear power-oriented approach in the political analysis of a nation.

There are several reasons why one should link foreign policy with nuclear policy. To begin with, the intensive capital commitment to nuclear power production requires government involvement to deal with both foreign and domestic issues an order of magnitude greater than all other industries. The public and private debates over nuclear energy issues and options include the controversies surrounding the budget, defense, weapons proliferation, the environment, unemployment, technology transfers, trade deficits, ideological competition, energy scarcity and energy dependency, etc.

Writing in the magazine, Nuclear Engineering International, Michel Pecqueur commented about the link between foreign policy and nuclear policy. "Today nuclear energy has grown up and is intimately blended in the technical, economic and political issues of the life of the country."^[136:45] Although this

statement pertained specifically to France, the nuclear power industry has the characteristic of permeating the socio-political events in any country. Therefore, the link between the nuclear policy of a nation and a nation's foreign policy is valuable to the political analyst as a point where one can expect to find a concentration of several elements of public and private concern. The study of the nuclear power controversy becomes the place to take the political pulse of a nation, to observe, so to speak, the intensity and direction of current political thought.

The formulation of nuclear policy in France is a highly visible process. One organization runs the whole nuclear industry. The Commissariat à l'Energie Atomique, or CEA, is responsible for controlling all nuclear activities from research to defense. One of the CEA's main responsibilities is to advise the French government on the formulation of nuclear policy. According to Michel Pecqueur, Adjoint à l'Administrateur Général Délégué du CEA:

Nuclear activities are now increasingly part of many aspects of the daily life of the country, for example: technical studies; safety; industrial organization; international relations; and national defence.

Thus, the government and administration must daily deal with nuclear matters, or with problems where nuclear matters are involved. As an horizontal organization CEA is able to take a global view of all the relevant aspects, and to advise government and administration accordingly on the formulation and implementation of nuclear policy. [136:45]

Clearly, a relationship exists between the French political process that formulates foreign policy and the CEA nuclear

policy activities. This relationship can be explored by the analyst for the purpose of producing evidence to show that the French nuclear power industry represents major trends in French foreign policy.

1. Defining French Foreign Policy

According to Dr. Dimitri Simes, Director of Soviet Policy Studies, Georgetown University, it is hard to define national objectives or specific foreign policy. "The country itself may not know what its policies are."^[205] The best source of foreign policy objectives must come from those public statements and policy papers which carry the indorsement of the Government.

The following statements will serve to identify three main areas for French foreign policy objectives. They are extracted from a document entitled, France's Defense Policy, the Report on the Program for Military Expenditures and Equipment for the Armed Forces for the 1977-1982 Period, adopted by Parliament as Law No. 76-531 on June 19, 1976, hereafter referred to as the "Defense document."

The world context for France's security policy is characterized by a few basic facts: first, that in East-West relations the quest for détente has replaced the cold war; second, the growing importance that the countries of the Third World, most of them the fruit of decolonization, have acquired in international relations; and lastly, the first signs, in the western part of our continent, of the economic and political organization of Europe.^[50:4]

It is possible to extract from this statement several key areas in which the French are involved. As a consequence of these concerns, certain roles emerge: the role of France as an independent international actor, the role of France as a guardian of the Third World's stability, and the role of France as an influence in the reorganization of Europe.

2. The Role of Independent International Actor

In the role of independent international actor, France has demonstrated the willingness to commit troops and supplies to prevent a major actor from gaining control over a Third World country. In less than one year, President Valery Giscard d'Estaing has committed French forces on five fronts in Africa and the Middle East. The justification given for some of this French activity is that France must fill the role abandoned by the United States since the Vietnam War and prevent Soviet efforts at destabilization in Africa.[91:17d]

The role of French intervention in post cold war international relations was explained by French Foreign Minister Louis de Guiringaud when he said: "It is probably the weakening or the disappearance of a certain kind of American presence in the world today encouraged the Soviets to profit in these various situations of tension.[2:61] The French, according to Guiringaud, are trying to help the Africans take control of their problems themselves.[2:61] Some critics of Giscard, however, have charged that "Giscard sees himself as another De Gaulle--seeking to enhance the image of France as a major power on the international scene." [189:39] For whatever

reason, the first principle of French foreign policy is to reverse the trend towards the isolationism evidenced in the 1960's and to project France into the main stream of international relations. Much can be added to the understanding of French foreign policy by comparing France to another independent-minded nuclear power, China.

One important parallel emerged from the visit to Shanghai Harbor in mid April 1978 by a French destroyer. This event marked the first time a Western warship had visited China since the Communist revolution. On this occasion Chairman Hua Kuo-feng declared France and China "a global united front against superpower hegemonism." [67:73] This statement reflects the sentiments of a large number of Frenchmen who still treasure the memory of Charles de Gaulle. It serves as a clue to the direction in which French foreign policy is headed as France pursues its role as an agent of international change.

Regardless of the reasons behind France's active participation in international politics, the future success of French foreign policy will be aided in large measure by the increasing success of the French nuclear power industry abroad. This will be seen in the second area of French concern identified by the Defense document--the importance of the Third World, and the role of French intervention.

3. Guardian of Third World Stability

Today the Third World nations, says the Defense document:

...constitute an essential factor in the contemporary world due to the importance they have acquired on the international scene.[50:5]

Mr. Georges Puravet, Industrial Attaché of the French-Commercial Consulate, when interviewed in San Francisco stated that concern for the Third World has always been a major objective of French foreign policy. France was protected by the markets and resources that her colonies provided until the decolonization of the 1960's. France was suddenly forced to revise her export policies and begin exporting for survival. Today, exports account for 14-15% of the French GNP compared to roughly seven percent for the US.[196] French foreign policy must, therefore, ensure the continuing stability and independence of the Third World both as a market for French products, and as the major source of raw materials that support the French economy.

One objective of French foreign policy is to maintain a position of trust and influence in African affairs. The French have long maintained an intensive web of cultural, economic and occasionally military relationships with their former colonies as well as several other African states. For example, during the recent crisis in Zaire, the French assumed Western leadership but with a style that avoided the appearance of colonial intervention. While Legionnaires policed several African states, the heads of some 20 African nations converged in Paris for the fifth annual Franco-African summit. Time magazine reported that "The hero of the hour was President Giscard, who was broadly cheered when he

declared, 'Africa for the Africans. Everything must be done to withdraw the continent from the rivalries of political blocs.'"[33:28] The basic element of French foreign policy towards the Third World is to maintain this "good neighbor" image while advancing the interests of the French.

The reason for direct involvement in the Third World is the long-held French view that the economic destinies of Europe and Africa are inextricably linked. Europe lacks adequate resources to survive, and Africa is the obvious source. The goal of French foreign policy is to take whatever action is necessary to maintain African stability and independence. Supplying nuclear energy is one strategy which will assist Third World development free from superpower influence.

The Defense document helps to explain additional reasons for the French commitment to Third World development and stability:

These states must also be taken into account because of the wealth some of them have acquired through their share of the world's resources of raw materials and energy, and the influence they can now exercise at both the regional and international levels.[50:5]

The reference to raw materials held by Third World nations draws attention to another reason given for the growing French military presence in Africa. Stated simply, the French troops help protect France's interest in raw materials, including copper in Zaire and uranium in Chad.[2:59] Thus, Africa serves France serves the Africans, and both French foreign policy and nuclear export policy is likely to reflect this relationship.

Another aspect of French foreign policy towards the Third World is evident in this continuation of the Defense document:

Lastly, these states have to face tremendous problems which, for many of them, are additional factors of internal instability and external vulnerability. They include economic underdevelopment, inadequate food supplies and energy and technological dependence.[50:5]

The Defense statement identifies the problems which France must try to solve to insure Third World stability. One aim of the massive restructuring of the French nuclear power industry after the 1974 oil embargo was to enable the French to provide the Third World with a measure of energy independence. The role of France as a major provider of the world's future energy needs is implied by the following statement by Jean-Claude Leny, managing director of the nuclear reactor construction firm, Framatome:

Following extensive structural changes, the industry has achieved a production rate five times greater than before. We now have every reason to believe that it has the stability and capability to face its national responsibilities and an active part in the development of nuclear energy for peaceful use the world over.[97:50]

Whereas the aim of the French foreign policy towards the Third World is to provide for their energy independence, additional benefits are derived from the ability of nuclear technology to aid economic development and trade. Time magazine has pointed out that the French are almost surely correct in believing that economic development will solve Africa's problem of

external influences. They quote a French official as saying, "There will never be stability in a world that includes both Stone Age people and nuclear powers. Our African strategy is one of well-being. We're convinced Africans would rather eat than die." [33:30] Because France is building its nuclear power industry with the expressed intention of supplying the Third World with its energy needs, the nuclear power industry helps to promote the basic element of French foreign policy... Third World stability.

The Defense document continues to outline the role of French foreign policy towards Africa and the Middle East:

The evolution of the Third World concerns France's security in more than one respect. Our country, now that it has become one of the top trading powers in the world, is obliged to give special attention to the conditions governing the cost and regular delivery of its supplies from abroad, for they govern to a large extent our own economic health. [50:5-6]

Through this statement one can discern the goal of French foreign policy to become the "key commercial intermediary between Europe and the developing countries of Africa and the Middle East." [49:5] According to the vision of the future projected by French economic planners in a special report by The Journal of Commerce, France envisions its role as the "Entrepot for Europe." [49:5] This report has stated that:

France is ideally suited to assume the role as the main channel for trade and investment flows between Europe and the Third World because it has historic ties with former colonies that are now major producers of scarce raw materials and, more significantly, because its coastlines, harbors and river systems provide easy access to Europe's industrial heart.

A striking example of the kind of deals France is seeking with Third World countries is the agreement under which France will sell Iran five, 1,000-megawatt nuclear reactors worth \$1.1 billion in exchange for increased Iranian oil deliveries to France.[49:5]

To make sure that France is ready to fill its projected role as a producer and an entrepot, the government is concentrating its development efforts on the creation of new industrial zones and ports along the Atlantic and Mediterranean coastlines. Clearly then, the role of intermediary between Europe and the Third World is a major aspect of French foreign policy. The summation of this policy is contained in the following statement from the Defense document:

France has chosen to make the most of her international position, which is unique in many regards, and to practice a policy of overture, dialogue and cooperation. She wants to help the states of the Third World that are the closest to her, both historically and geographically, to strengthen their independence and secure their development. France is aware of the current importance of North-South relations and she intends to help search for and define a more just, more rational and more stable new economic order.[50:6]

4. Influencing the Reorganization of Europe

The third area of concern identified by the Defense document for French involvement casts France as an architect in the redesigning of pan-European relations. The Defense statement calls attention to the "...profound solidarity that has established cultural economic and political ties among the nations of Western Europe." [50:6]

Interdependence is formed and strengthened each day by geographic proximity, easy communications, booming trade and an ever-expanding field of cooperation. Solidarity is reflected "in Western Europe's growing awareness of its common interests, of the unity of its cultural heritage that underlies the diversity of national expressions, of the wealth and strength of its material and human potential." [50:6]

This solidarity is behind the spirit of enterprise

...that has given life and form to the grand design of European unity for more than a quarter of a century now. Despite alternating phases of progress and consolidation this spirit has already made concrete achievements. [50:6]

An example of concrete achievement is the joint planning and construction of major European nuclear energy projects for the mutual benefits of all participating European states. This is a clear indication of how the French nuclear power industry has contributed to the "grand design of European union."

More important than the French desire to remain independent from superpower influence is the pragmatic realization that Western Europe must somehow remain outside the same superpower influence. Therefore, France's foreign policy interests are served not only by influencing the economic development of Western Europe but also by ensuring that no other international actor can impose its own foreign policy restraints on Western Europe as well. The nuclear power industry, with its fuel cycle capabilities, gives France the means to exert a measure of influence in Western European

affairs and to reduce the hold over Europe by other energy suppliers. The following excerpt from the Rand Report, "Europe's Changing Energy Relations," bears this out:

(The) security of supply of nuclear raw material has been an important factor in Western European thinking precisely vis-à-vis the United States, with the principal accent on possible economic rather than political conflicts. Since the 1960's, the French, the Germans, and others have feared that, without alternatives to the U.S. monopoly of enrichment services, the development of their nuclear power and nuclear equipment industries would be stifled by insufficient and capricious supplies of enriched uranium; that the monopoly would be used to favor both U.S. utilities and the U.S. nuclear equipment industry that is competing with the Europeans for exports; and that to continue relying on U.S. services would too drastically magnify Europe's economic, technological, and political subordination to the United States. Consequently, at the beginning of the 1970s, the groundwork was laid for the development of alternative enrichment facilities.[117:39]

Economic influence over Western Europe is a major factor in French foreign policy. Towards this specific end, the ambitious nuclear power program is allowing France to take a leading role in meeting the energy needs of Europe. For example, France is less dependent on foreign uranium resources than it has been on oil imports. Proven domestic reserves of economic-grade ores amount to approximately 5 percent of proven world reserves in this category. These should meet the whole of French requirements until 1985 or 1990 according to Jean-Paul Silve, in his article for the Nuclear Engineering International entitled, "Fuel cycle industry combines private and public Enterprise." [154:55]

These uranium reserves give France an advantage over other Western European nations in the field of energy independence. Furthermore, the technological and industrial advances made by the French nuclear power industry give the French a commanding lead in several areas of nuclear power production. Taking into account the energy situation of France during the oil crisis, a vast nuclear energy program was launched on sound technological and economic bases. This considerable effort, which will reduce French dependence on imported energy, has resulted in Framatome becoming one of the world's leading reactor builders. Additionally, in the fuel cycle field, France has been able to ensure access to substantial uranium reserves and the promotion and construction on its own territory of the first large European enrichment facility. Finally, France has at its disposal the first operational facility for reprocessing irradiated fuel working in the world.[136:47]

Everything taken into account, the French nuclear power industry has created a favorable condition for the French to influence and build a united European community. This community would exist free from superpower or petro-power energy dependence largely due to the French nuclear industrial strength.

At the end of 1975, Framatome started operating at Chalon-sur-Saône, the largest nuclear component production plant in Europe. Framatome and its affiliates have invested nearly Fr 1000 million in the French nuclear industry. This figure, according to Mr. Silve, gives an idea of the industrial

risk involved and of the effort made to enter the nuclear market.[154:56]

Another indication of the enormous commitment to nuclear power is the role of the French industrial effort in reshaping Europe's economy. Jean-Paul Silve points to the large enrichment plant in the south of France now under construction by Eurodif, the participants in which include Belgium, Spain, Italy, and Iran. The purpose of this plant is not only to provide a substantial portion of the French requirements for enriched uranium after 1979, but to combine with other projects under study (for example fast breeder technology) with a view to complete European nuclear fuel independence after 1984.[154:56]

French foreign policy towards European unity has already been served by the nuclear power industry. Georges Venryes, CEA's chief of nuclear industrial applications, points this out in an article about international cooperation to benefit the development of advanced reactors. He states that the French reactor designs meant to benefit commercial interests "...nevertheless do not induce us to monopolize the benefits for ourselves alone, and to close the door to others." [178:64] Venryes says that France demonstrated this clearly in 1974 when a complete set of agreements were concluded by Italy and France, closely associating the two countries in all aspects of the future development of fast breeder reactors. [178:64] According to Venryes:

The same spirit led to the Franco-German agreements which were signed in preliminary form in May 1976, and which set the stage for very close cooperation between France and Germany with respect to research and development and engineering work, as well as industrial activities. Germany is also associated with Belgium and Holland in these areas.

Thus a pattern is emerging, throughout Europe, of a gradual concentration of efforts and resources. It is to be hoped that it will continue to spread, because it constitutes a major guarantee of effectiveness and success for the future of fast neutron plants.[178:64]

Thus nuclear power has followed the pattern of pan-European cooperation which can be interpreted as an element of French foreign policy.

5. Paris as a World Metropolis

Along these same lines, the Journal of Commerce reported in 1974 that:

The new administration of President Valery Giscard d'Estaing would like to see Paris become an "international capital" as the favored site for European regional headquarters, for Europe-wide financial institutions, and for industrial research and development centers.[49:11]

Therefore, the current thrust of French development is the "internationalization of the economy, with Paris serving as the new international capital." [49:11] The brand new Charles de Gaulle Airport located in Roissy, France is listed as one of the pillars of the French government's plans to make France a leading international gateway for the nine-nation European Economic Community. [49:13] Locating the major

source of Europe's future nuclear fuel production and enrichment service in France also serves to make Paris a dominant economic Mecca. Thus the French nuclear power industry aids this goal of French foreign policy.

Beyond the ambition to make France the central source of pan-European economic and political power lies the goal of French foreign policy to expand the private industrial sector to global proportions. The goal is to make French industrial strength operate wherever and however possible throughout the globe. According to Michel Pecqueur, the nuclear power industry is a prime example of this principle in action. "Owing to its strong position in the fuel cycle market, CEA can ensure, with the participation of private French industry, adequate fuel supplies for national needs and keep free a substantial potential for export." [136:47]

"French industrial companies," says Michel Pecqueur, "must develop their industrial and commercial activities in France and abroad. Whether through shares or licenses, these activities are reinforced by the considerable backing of CEA." [136:47]

The French government agreed with this claim that the role of nuclear power can be used to bolster French industry in the private sector with the view of extending French industry overseas. In August 1975 CEA received the government's authorization to combine its fuel cycle activities into a private subsidiary. The new company was known as Cogema with 100 percent government ownership despite its private legal

status. By December of 1976 Cogema held an impressive potential in the field of the nuclear fuel cycle: domestic mines, uranium reserves, shares in overseas mining ventures, isotopic separation and reprocessing facilities. All this was achieved in close relationship with the rest of private industry.

In addition to the far-reaching worldwide nuclear fuel cycle industry, the French foreign policy objectives are benefiting from the nuclear reactor plants built and exported by Framatome. According to Jean-Claude Leny:

Framatome can play a larger part in export contracts than in home contracts and the range of plants for export extends from 600 to 1300 MWe (megawatts). For the supply of complete turnkey nuclear power plants to other countries, a special organization is set up in each case. A consortium is established led by Framatome as manufacturer of the nuclear island and including one company responsible for civil engineering, and Framaleg, a Framatome subsidiary which is in charge of general contracting and contract management. A joint EdF (Electricité de France)/Framatome subsidiary currently being formed, will be in charge of technical coordination of the whole plant.[97:55]

Thus one sees the major role played by the advanced reactor technology segment of the nuclear power industry in advancing the cause of international industrial expansion. Advanced reactor technology has given France a considerable lead over other suppliers of the world's demand for nuclear generated electricity. The broad-based industrial program mates perfectly with French nuclear export policies. For example, the French are encouraged to export whole nuclear complexes

or only the individual components depending on the needs of the recipient. Furthermore, the foreign export licensing policies allow components and equipment to be manufactured by companies in the client countries, if it is technically and economically feasible. It might be argued that the French international industrial expansion policy can be measured by the progress of French-supplied nuclear commerce.

Another foreign policy benefit of the French nuclear industry is the international cooperation surrounding the specialized transportation of nuclear components and fuel. The CEA, for example, has its own transportation facilities but the major proportion of transportation requirements throughout the various stages of the fuel cycle are handled by Transnucleaire, a company affiliated with several other companies in other countries including the UK, Germany, and the U.S. The specialized equipment, worldwide experience and network of connections enable Transnucleaire to handle every type of worldwide transportation operation for a wide variety of prospective customers.[154:57]

The Defense document identified three main areas where French foreign policy plans to operate. The first casts France as an international actor in the new era of detente. The second area makes French foreign policy responsible for the stability of the Third World. The last area recognizes the opportunity for France to promote pan-European cooperation and to project French industrial, economic and hence political power throughout the world from an international capital in Paris.

Each of the identified areas of French foreign policy are served by the burgeoning nuclear power industry and commerce. One reason the nuclear industry has this capacity stems from the similarity of purpose of French foreign policy and French nuclear policy as they pertain to exports. Jacques Sornein, director of general management in Cogema, explains the policy of one of the many segments of the nuclear power industry, the fuel cycle company:

The policy is to offer integrated services covering the whole nuclear fuel cycle, including fuel management, and to develop an active exporting policy in this field. This approach has been adopted because Cogema's own industrial capacity plus that which it has access to largely outstrips French requirements. Also the company at present holds a strong position in the key areas of uranium mining, enrichment, and reprocessing which gives it advantages over its international competitors. It also owns and manages various and diversified means of transportation for radioactive materials that can meet a vast range of clients' requirements.[156:57-58]

In other words, the nuclear industry has the capacity to produce more than it can use at home. Therefore, the nuclear industry is equipped with the means by which it hopes to corner as much as it can of the world's nuclear power requirements. It is easy to see why the French nuclear power industry has adopted a policy that matches the aspirations of the French foreign policy. Although the two policies are similar in purpose and intent, the objective of this section has been to show that French government has actually used the commercially exploitative nature of the nuclear power industry to enhance the foreign policy of the French nation.

This section has served to identify some of the major goals of French foreign policy as it exists today. The next section will present the role of nuclear policy in contemporary domestic politics. The ability of the nuclear industry to reflect French domestic political trends will be examined to determine whether or not nuclear power analysis can achieve the same results of determining national domestic policy as it seems to have done for the foreign policy of France.

D. NUCLEAR ENERGY AND FRENCH DOMESTIC POLITICS

The last chapter identified several of the goals of French foreign policy. In order to understand the role of nuclear power policy in the French political system it will be necessary to define the relationship between French foreign policy and contemporary domestic politics. Foreign policy must undergo considerable public and private debate before it is adopted. According to Professor Milorad Drachkovitch, the French are more interested in the processes and procedures for the agenda than for the final vote.^[202]

Major and minor political figures play an active role in the formulation of French foreign policy. In the process of challenging or defending foreign policy options, these actors help to articulate and reflect the goals and aspirations of the French people. Popular support is sought for individual programs as part of the legislative process in a style reminiscent of De Gaulle when he appealed directly to the people to overcome parliamentary opposition. Therefore, French

foreign policy cannot be assessed without an understanding of the important role it plays in the hands of the skilled politician.

1. Public Debate

Public debate forces the government to deal with both national and international forces while formulating its foreign policy. Despite the volatile nature of French domestic politics, the final product of foreign policy is one of the clearest and most determined in the world, enabling France to exist as a major actor outside of superpower influence. Jesse W. Lewis, Jr., writing about France has said:

"In the broad area of foreign and defense policy France is taken seriously and has credibility both because it is a nuclear power--the only acknowledged one in the Mediterranean--and because it has sufficient domestic cohesiveness to see its policies through." [101:111]

The purpose of this section is to go beyond an examination of the ability of nuclear power to enhance a country's foreign policy. Evidence will be presented to show how the nuclear power industry is used to serve not only foreign but domestic goals.

One of the key issues in the March 1978 elections was the French economy. Each of the major candidates promised ambitious programs for industrial reform, designed to cure the stagnation, inflation, and unemployment, and to regain the confidence of large investors, consumers and wage-earners alike. A key element in Giscard's campaign promise was the

ambitious nuclear power program, promising to free the country from 70 percent of its imported energy requirement by 1985. Of all the candidates, only Socialist party chief, Francois Mitterrand decided to challenge the government's policy. Mitterrand sought to attract the French anti-nuclear lobby after 30,000 protestors staged a noisy demonstration at Super Phénix, the big French plutonium breeder reactor east of Lyon in August, 1977. Mitterrand's pre-election campaign speeches attacked the government's policy of headlong nuclear expansion as reckless, "launched like a railroad engine at 400 kilometers an hour." [144:22] Auberjonois reported the government's strategy in his article entitled, "Giscard Visiting Atomic Site:"

To deal with domestic opposition, the French Government has sought to either sidestep the debate or steal the thunder of critics with timely public gestures.

Only a day before the rally against the reactor site in Creys-Malville, President Valéry Giscard d'Estaing chose to visit a nearby uranium-enrichment plant and assert his commitment to nuclear programs. [10:10]

2. The Role of Nuclear Power Analysis

Mitterrand's party failed in the election. The major reason given for this failure was the inability of Mitterrand's Socialists and Georges Marchais' French Communist Party to maintain the Union of the Left throughout the election. One of the subjects of disagreement between the Socialists and Communists was nuclear energy policy for France. While Mitterrand was courting the ecologists and advocating a

referendum on the government's ambitious nuclear energy policy, the French Communist Party was supporting the all-out program of the State. This disagreement mirrored the many differences of opinion that characterized the defeat of the Union of the Left. Therefore, one can argue that nuclear power analysis could be used to uncover and highlight domestic political trends.

A second benefit of using a nuclear power approach to analyze domestic politics is its ability to predict the amount of popular support generated by a party platform during an election. For example, the anti-nuclear debate prompted by Mitterrand's attacks on Giscard d'Estaing's nuclear program was also a challenge to the basic principles of the government's program for economic recovery. By using nuclear power analysis, one can look beyond the publicly debated issues of nuclear energy to determine whether or not the government's program would enjoy popular support. For example, Mitterrand was calling for a referendum on the government's nuclear energy policy. Political observers covering this campaign, believed that such a referendum would in fact show that a majority of the people would favor a nuclear program.^[10:10] "There is no alternative." wrote the newspaper, Le Figaro, about the Socialists anti-nuclear campaign, "The choice of nuclear energy is logical and unavoidable."^[10:10] Most Frenchmen, concerned about rising unemployment, would probably favor the nuclear power industry with its beneficial effects on the French economy since the impact of the nuclear industry exceeded by far the narrow

circle of heavy component manufacturers. Many other industries are involved, producing valves, fittings, auxiliary piping, electrical generating equipment and controls. Conventional occupations are involved with designing and building the hardware and software, site preparation, research, mining, financing and transportation. In other words, the government decisions to exercise its nuclear option had a snowball effect on the economy.

It is difficult to assess the effect that Mitterrand's campaign to halt the French nuclear industry had on the elections. It is significant, however, that the new Minister of Industry, appointed by Giscard, following the center-right's stunning electoral victory was André Giraud who has been chief of France's Atomic Energy Commission since 1970. This appointment was one of only five new cabinet positions filled by Giscard specifically to keep a campaign promise that his cabinet "would contain some new faces who would symbolize the need for social reform in France."^[29:32] It is obvious that Giscard's choice of the man behind France's nuclear program to head the Ministry of Industry indicates that both the president and his new chief of industry will be behind France's nuclear energy policy. Thus the nuclear power industry has served to identify the new administration's decision to pursue its ambitious industrial reorganization; a move that reflects a current trend of French domestic politics. Under Giscard's leadership France projects its foreign policy roles as an agent of international change, as defender of the Third World's independence, and as a European power. All three roles were

played out when French troops "rescued" the Europeans trapped by the invasion of Zaire. Newsweek says that "Giscard's show of power abroad improved his political position at home. His popularity increased after his first big overseas operation-- the French airlift of 1,500 Moroccan troops to defeat an earlier rebel attack on Zaire in April 1977." [2:59] During the current Zaire crisis President Giscard achieved domestic popularity at the fifth annual Franco-African summit with his "Africa for the Africans" speech which prompted Gabon's president, the current head of the Organization of African Unity, to declare that Giscard deserved the Nobel Prize for his African policy. [34:28] The popularity demonstrated for the President's aggressive African policies emphasizes the role of foreign policy in the French political process.

The nuclear power industry serves the French politician by providing an overseas involvement which demonstrates to the French constituency the successful role of France as an independent international actor. For example, when Giscard refused to back down under pressure from Washington on a proposed sale of a French fast-breeder reactor to Pakistan, he demonstrated a familiar brand of French toughness reminiscent of De Gaulle. The political implications of this were not missed by the U.S. press corps. A New York Times article stated:

The United States is aware that the issue has considerable domestic political importance in France and that it would hurt President Giscard d'Estaing if there were the slightest indication that he had yielded to pressure from Washington. [98:A6]

3. Conclusion

France sees herself today as a "leader among peers" in the European Common Market. Despite the bilateral struggle for Europe between the U.S. and the U.S.S.R, France is trying to restore the prestige and bargaining power it once enjoyed as a nineteenth century superpower. "Super-nationalism" is a value shared by the average Frenchman. The very existence of the great diversity of political goals among the French, the coalition strategy which this diversity of goals and multi-party system imposes, and most importantly, the French self-image as a major political actor force prospective political leaders to exceed their domestic political role to gain support.

Most comparative political scientists narrow their description of political systems to the processes that exist within the national framework, thus ignoring the international aspects of the French experience. The nuclear power industry can help to transcend this arbitrary national boundary to help explain the extra-parliamentary role played by French candidates to increase popular support.

As demonstrated previously in this chapter, the nuclear power industry has made great inroads in establishing France as an influence in Third World countries. It also offers excellent opportunities for advancing France's position as an economic and commercial world leader. It has been made clear that because the nuclear power industry serves French foreign policy objectives, it can be used in the hands of astute politicians to

increase their popular support and political influence. It is also clear that future French political debates will help determine the role that the nuclear power industry will play in French foreign policy. One must conclude, therefore, that the nuclear power industry is both a source and an indicator of French foreign policy.

IV. CONCLUSION

International relations are becoming increasingly complex. Worldwide information and communication and the search for natural resources have drawn remote areas and primitive peoples into the concern of the mainstream of international policy.

Foreign aid and military arms transfers of a decade ago are becoming passé. Middle Eastern nations now rival the military power, influence and wealth of their former European benefactors. Although it was once clear which country was the benefactor in an arms transfer agreement, this distinction faded recently when the Shah of Iran was encouraged by the U.S. to buy the sophisticated F-14 weapons system in order to help the American manufacturer out of financial difficulties.

Along with the changing political picture in the world is the ever-increasing unification of national economies under a worldwide economic standard. The European currency now being discussed is one example of this change. The effect this change has had on national economies is to expand the decision-making process of national monetary decisions, once the exclusive domain of congress and parliaments, to include state department and foreign ministry financial advisors, and in some cases, foreign governments.

Recent technological developments in weaponry, e.g.; the neutron bomb, tactical nuclear artillery shells, etc., threaten

to increase the likelihood that regional conflicts will be settled by military means. The proliferation of fast-breeder reactors has increased the complexity of international relations by increasing the danger that terrorists could acquire the weapons grade fuel and use it for nuclear blackmail.

Conflicts are resolved short of military interaction by several alternative means involving economic and political interaction on many different levels. Often these solutions affect a wide range of international actors. For example, nations invoke oil embargos, suspend aid, extend credit, cancel contracts, or submit to public debate in attempting to influence an outcome short of a military show of strength. Often economic solutions circumvent established treaties and organizations. As a result of the complex interaction networks, foreign policy decision-makers require rapidly acquired, accurate assessments of changing events in order to formulate effective foreign policy. Each decision must be assessed before it is implemented for its possible consequences in as many spheres as can possibly be predicted. In all cases, however, the political analyst is charged with the task of monitoring international relations. The use of a nuclear-oriented approach has been demonstrated in global, continental and national perspectives. The global perspective uncovered nuclear-related international networks that are operating irrespective of national policy or international regulatory control. The existence of these networks and the methods they employ to cope with energy scarcity correspond to similar economic trends experienced in a variety of multinational industries and corporations: cooperative

aerospace technology, shared computer systems, joint development and production of defense systems, pharmaceutical research and development by independent companies, to name a few. Each of these apolitical, economically-oriented networks exhibits evidence of being affected by international trends of cooperation and conflict, and consequently reflects changing political and economic developments. However, no single network can equal the network involving nuclear power for its ability to comprehensively reflect not only international trends of economic and political development, but also scientific, environmental, sociological, financial, military, industrial and energy developments.

The continental perspective highlighted areas of international cooperation and conflict present in the unification and industrial expansion of Western Europe. The continental perspective also focused on the ability of the nuclear power industry to chart the trend toward the reconciliation of the economic and political differences that historically have separated Eastern and Western Europe. Furthermore, the continental perspective of nuclear power analysis provided a device to measure the success or failure of economic re-approachment between certain industrial nations of Eastern Europe and those of the European Economic Community.

Finally, this thesis focused the nuclear power analysis on France. French nuclear power export policy exists today as the cutting edge of French foreign policy. As it inherited the legacy of the French arms transfer policy, it presents the

political analyst with several historic parallels by which to compare the scope and direction of French foreign policy with its scope and direction a decade ago. Furthermore, French nuclear power export policy exists as a microcosmic copy of French economic policy, designed to curb unemployment and satisfy the demands of the heavy industrial sector. Therefore, by charting the progress of the nuclear power industry's expansion at home and abroad, the analyst is provided with the means of studying French domestic and foreign policies.

The nuclear power analysis will require all three perspectives, global, continental and national, working in concert to achieve a comprehensive picture of the political, economic and military trends in international relations. One can envision a computer network analyzing data from events, testing pre-programmed hypotheses and constantly scanning interaction maps similar to the five-step methodology suggested in Section D of Chapter I. In such a system one could expect trends to appear. These trends could be monitored for their closing rate towards other trends calculated to be on collision courses. Current air traffic control computer technology provides this service for aircraft. The warning, "Conflict Alert," is signaled both on the controller's scope and in each cockpit of the endangered aircraft. Cockpit displays signal a recommended escape direction, up or down, right or left, corresponding with an opposite direction given in the other aircraft. Pilots are trained to react immediately to these directions, suspending judgment until the conflict is resolved. Supposedly, each pilot is secure in the knowledge that his action is not made

unilaterally, but in compliance with an independent safety-oriented computer, equipped to account for the overall traffic situation.

With enough imagination one might envision an international trend analysis computer similar in design to the German automotive computer that is being tested for automobile traffic control in major German cities. The dashboard display picks up inputs from magnetic strips in the city streets, utilizing data from a central traffic control computer. Each car is individually directed down side streets and alternate traffic routes to avoid major traffic jams when they occur.

The possibility of this technology being used for foreign policy decision-making is not that remote. By categorizing nuclear-related events (i.e., Brazil buys a reactor from West Germany) and linking these events to a decision matrix involving global, continental, national and regional political, economic and military networks, one might graphically illustrate the possible ancillary consequences of choosing one alternative over another. Previously overlooked repercussions could be avoided. International partners could be forewarned and anticipated rival reactions could be circumvented. Congressional debate generated by executive programs in areas such as proposed arms transfers might be shortened by running the proposals through comprehensive computer trend analysis. The possibilities are limitless.

This thesis has suggested that nuclear energy, with its far ranging effects on international economics and society, is one logical choice for comprehensive international political

analysis. Other approaches, or combinations of analytical frameworks based on other industries or other global phenomena may prove more productive. However, this thesis has served its purpose by suggesting that, regardless of the indicators used, political analysis must and can keep pace with the rapidly changing, ever more complex nature of international relations.

APPENDIX

(as of June 1, 1977)

(195)

COUNTRIES THAT ARE PARTIES TO THE NUCLEAR NON-PROLIFERATION TREATY

The countries listed below are participants to the Nuclear Non-Proliferation treaty:

Afghanistan	Lesotho
Australia	Liberia
Austria	Libya
The Bahamas	Luxembourg
Belgium	Malagasy Republic
Benin	Malaysia
Bolivia	Maldives Islands
Botswana	Mali
Bulgaria	Malta
Burundi	Mauritius
Cambodia	Mexico
Cameroon	Mongolia
Canada	Morocco
Central African Republic	Nepal
Chad	Netherlands
China, Republic of	New Zealand
Costa Rica	Nicaragua
Cyprus	Nigeria, Federation of
Czechoslovakia	Norway
Denmark	Panama
Dominican Republic	Paraguay
Ecuador	Peru
El Salvador	Philippines
Ethiopia	Poland
Fiji	Romania
Finland	Rwanda
Gabon	San Marino
Gambia, The	Senegal
German Democratic Republic	Sierra Leone
Germany, Federal Republic of	Singapore
Ghana	Somalia
Greece	Sudan
Grenada	Surinam
Guatemala	Swaziland
Haiti	Sweden
Holy See	Switzerland
Honduras	Syrian Arab Republic
Hungary	Thailand
Iceland	Togo
Iran	Tonga
Iraq	Tunisia
Ireland	Union of Soviet Socialist Republics
Italy	United Kingdom
Ivory Coast	United States
Jamaica	Upper Volta
Japan	Uruguay
Jordan	Venezuela
Kenya	Vietnam
Korea, Republic of	Western Samoa
Laos	Yugoslavia
Lebanon	Zaire

SOURCE: General Electric Company internal information. Copy provided during interview.

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